$3x^2 - 12x + 9y^2 - 18y - 6 = 0$

$3(x^2 - 4x) + 9(y^2 - 2y) - 6$

$3(x-2)^2 + 9(y-1)^2 = 27$

$\frac{(x-2)^2}{\frac{27}{3}} + \frac{(y-1)^2}{\frac{27}{9}} = 1$

$\frac{(x-2)^2}{3^2} + (y-1)$

centre $(2, 1)$

$a = 3$, $b = \sqrt{3}$

$ae = \sqrt{a^2 - b^2}$

$= \sqrt{9-3} = \sqrt{6}$

$(2-\sqrt{6}, 1) - (2+\sqrt{6}, 1)$

$\frac{2 \cdot 3}{3} = 2$

$= \frac{9}{\sqrt{6}}$

$V = (5, 1)$, $(-1, 1)$

$2/3$

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ECONOMIC GEOGRAPHY

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ECONOMIC GEOGRAPHY

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FIFTH IMPRESSION

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PREFACE

In chapter I, under the heading "The Field of Modern Geography," the authors have set forth their conception of geography as a branch of higher study. In writing the book the authors have tried to emphasize geographic interrelations and to show how peoples, in pursuing their economic activities, have adjusted themselves to their geographical environment; for example, to indicate *why* particular crops are raised in certain places and others in other places; and *why* one nation has directed its economic life along certain lines and another along other lines. The idea of human adjustment to natural environment is the key note of modern geography, especially when pursued by students of college age, for whom this book is designed. It is this study of human adjustments that lifts geography to the level of a science and gives it a considerable part of its educational value.

But the body of knowledge included in Economic Geography has also a high utilitarian value. It has something to contribute to those citizens who would have a world outlook and an international point of view. A knowledge of the poverty or plenitude of the resources of the various countries, of their stage of industrial development, and of their elements of economic strength or weakness, is a kind of knowledge that educated people need and use.

The book naturally divides into two parts. Chapters I to XVIII, inclusive, treat of the United States and Canada. So similar are the geographical influences which are molding the economic life of the United States and of southern Canada that it seems wise to treat the two countries together at many points in these chapters. However, there is need for a summary chapter dealing with Canada as a whole, and it is provided in chapter XVIII.

It is commonly recognized that Economic Geography includes two different and distinct types of units of study; they are (1) commodities or products, and (2) regions. The former include any or all of the commodities whose production and distribution are significant matters in industry and commerce, notably the food materials, textile fibers, and minerals. The serious student of Economic Geography desires to know the conditions under which the agricultural staples are produced in various parts of the world, where the world's great mineral deposits are located and how they are obtained, and under what conditions the raw materials of industry are economically produced and marketed.

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A majority of the significant commodities of commerce are produced in the United States; consequently their detailed treatment is found in the various chapters devoted to this country. Other commodities of which the United States is not a large producer—for example, raw silk, raw rubber, coffee, tea—receive detailed treatment in connection with the countries in which they are respectively important.

The second part of the book deals with foreign countries. Among geographers there is some disposition to favor the divisions of the continents into *natural* or *geographical* regions and to make these the units of treatment. Such a plan might treat, for example, the North European Plain, extending from northern France, through Belgium, the Netherlands, Prussia, Denmark, and southern Sweden, as a single geographical unit, largely disregarding national boundaries. For the specialist in geography such a plan has certain attractions and advantages. Such natural regions, however, are not the ones with which the commercial world in practice has to deal. The reading and traveling public, the business world, the international news, statistical reports, and international relations generally, take account of countries or nations as units. So universally do people think and speak and write of foreign lands in terms of political units—France, Italy, Japan—that they seem unquestionably to form the appropriate regional units of study in the Economic Geography of foreign lands.

The book contains no treatment of climate or physiography as such, although the influence of the physical environment is constantly stressed. It is expected that students who enter upon the study of Economic Geography in the more advanced phases will already have acquired a knowledge of the elements of physical geography. Students should regularly use a school atlas in connection with the text.

Careful attention has been given to the selecting and preparing of illustrations; they are believed to have as much teaching value as corresponding parts of the text, and it is hoped that they will be used.

Doubtless it is unnecessary to say that the lists of reference materials at ends of chapters and at the end of the book are not intended to be exhaustive. These lists include only a few of many references that might profitably be given. The lists do, however, include some of the recent and readily available books, reports, documents, and articles. Purposely, very few references to periodical literature are made.

The authors are indebted to many people in many ways—too many to enumerate specifically. Thanks are especially due to Dr. Selma L. Schubring for helpful suggestions and painstaking reading of parts of the proof.

To various departments of government in Washington, and particularly to the publications of the departments of Agriculture and Commerce, hearty acknowledgment is due. We desire to make special reference to the work of Dr. O. E. Baker, Bureau of Agricultural Economics, Department of Agriculture. From the excellent illustrative matter issued by this Department we have borrowed freely and appreciatively.

R. H. Whitbeck.
V. C. Finch.

University of Wisconsin,
January, 1924.
Revised, 1929

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INTRODUCTION

ECONOMIC GEOGRAPHY

CHAPTER I

THE FIELD OF MODERN GEOGRAPHY

The peoples of the earth are engaged in various occupations—farming, fishing, lumbering, mining, manufacturing, and others. They are led to follow these occupations through the influence of various factors, some of which are the conditions of their earth environment. The peoples who live on the coast of the North Sea, for example, are interested in fishing because the shallow waters of this sea are the feeding grounds of fish which are found there in great numbers. For these peoples, an important feature of their environment is the shallow sea teeming with fish, and they have adjusted themselves to this condition by the development of fisheries. The people of Norway, the Indians (Haida) of British Columbia and the Indians of southern Chile occupy fiorded mountain coasts where both topography and climate discourage agriculture but encourage a sea-faring life. Each of these peoples had adjusted its mode of life to the situation in a similar way—by seeking much of its living on the sea.

In Sweden thousands of people are engaged in lumbering; in Wisconsin a large percentage of the farmers are engaged in dairying; in California, in fruit farming; in Texas, in raising cotton; in Pennsylvania many are employed in mining coal and others in making steel. In Switzerland the mountain farmer has a natural resource in the grass of his Alpine pastures. This he utilizes to feed dairy cattle for the production of milk, but, on account of rough topography, he is at a disadvantage with respect to markets, so he turns much of the milk into cheese, in which concentrated form it may be most advantageously shipped to market. Still another type of human adjustment to natural environment is found in Britain where the presence of a vast natural resource—coal—has encouraged the people to suit their economic life to their environment by the development of manufacturing and commerce.

Illustrations need not be multiplied for it is a matter of common observation that people are everywhere engaged in the occupations which their particular surroundings encourage. They are adjusting themselves to their natural environment.

Modern geography treats of the adjustments made by peoples in their endeavor to fit themselves with the greatest possible advantage into their natural or earth environments. It is the purpose of geography to show how people have been influenced by their natural environment to live in certain places, to acquire certain characteristics, and to occupy themselves in certain ways. The features of natural environment to which people most frequently adjust their lives are (1) the nature of the climate in which they live, (2) the character of the land surface, whether plains, valleys, mountains, or other forms of topography, (3) the quality of the soil, (4) the presence or absence of fuel and other sources of power, of minerals, forests, fish and other natural resources, and (5) geographical position with respect to other places and other peoples.

N.B

The Field of Geography.—The field of geographical studies is wide and has many aspects because man's political, social, and economic life is related in so many ways to features of his natural environment. Students in the field of scientific geography have specialized in one aspect or another of the relation of human life and activities to natural environment and have created subdivisions of the field, of which the more important are (1) economic geography, (2) political geography, (3) historical geography, and (4) military geography.

Economic geography is in itself a broad field. It endeavors to show the relations existing between topography, climate, geographical position, and soil and other natural resources on the one hand and upon the other the various types of activity by means of which man gains his living. The breadth of this field has invited further subdivision resulting in such phases as (*a*) *agricultural geography*, which treats of the distribution of crops and the various forms of agricultural or pastoral industry in their environmental relationships, (*b*) *industrial geography*, which may be thought of as dealing similarly with the extractive[1] and manufacturing industries, and (*c*) *commercial geography*. *It is the large field including these three intimately related phases of the subject—the field of economic geography—to which this volume is devoted.*

Non-geographic Influences.—An endeavor to explain the distribution of agricultural products, the location of extractive and manufacturing industries, or the trend of commerce as the result solely of geographic influences would be misleading. Many conditions which are not at all geographic in nature combine with those which are geographic to complete the economic picture. *Social or human characteristics,* such as inherited racial traits or customs, necessarily influence a nation's industry. For example, the artistic ability of the French people, the patient industry of the Chinese laborer, and the existence of the system of caste in India are conditions which, so far as industry is concerned, are no less important than are those of the natural environment. *Historical factors*, such as the accident of an early start (*e.g.*, the carpet and rug industry of Philadelphia), often give great importance to an industry to which purely geographic conditions are only ordinarily favorable or even may be distinctly unfavorable. *Economic factors*, such as the availability of capital and labor, efficiency of management, and stage of economic development, are of vital importance in influencing industrial development. So also is the *political factor* of stable and efficient government.

---

[1] Such industries as mining, lumbering, and fishing are termed *extractive* because they consist in extracting or taking possession of the natural wealth of the earth or sea.

In the study of economic geography these non-geographic factors must be referred to continually in drawing pictures of life and conditions in the regions and countries to be studied. It should be kept clearly in mind, however, that detailed discussions of the operation of these factors belong to other fields. The primary object of economic geography is to make clear the interrelation between physical or earth environment, and the economic life of peoples.

Practical Aspects of Geography.—Geography has been considered a subject which contributes mainly to the culture and general information of its students. While this is in large measure true, there are practical aspects to the subject which deserve attention. Europeans were earlier than Americans in developing the field of modern geography. This may be attributed in part to their earlier acquaintance with and practical interest in foreign peoples, their products and their trade. Such interests were intensified by the necessity felt in Europe for colonial expansion and by the fact that emigration had scattered Europeans to all parts of the world.

America has lived more within herself. A vast area containing a wide variety of resources had to be conquered and developed. Americans were less dependent than Europeans upon foreign markets and foreign sources of food and raw materials. Time has changed this situation and the United States is now the world's greatest commercial nation. Merchants in every state and in every large city transact business with foreign customers. (International business has developed so rapidly that many persons are engaged in foreign trade who have but little knowledge of the nature of their foreign markets, or of the physical conditions which surround the lives of the people whom they endeavor to please.) It can not be doubted that the efficient conduct of American business in the future will demand more of the type of information which is the subject matter of economic geography.

Note

There are various sorts of political, commercial, and industrial problems which can be more intelligently handled in the light of geographical information. The proper use of land depends upon a knowledge of what the land may best produce. Large areas in the United States have been claimed and sold for agricultural use which should have been left to forest or grazing. The framing of laws relating to such land should be preceded by careful geographical surveys of the region.

Modern industries require many kinds of raw materials and buyers are generally well informed as to the qualities of the materials they are required to purchase. Knowledge of the conditions of their production, the conditions which give them their special qualities, is by no means so common. Its possession makes a superior buyer. The selling of goods under modern conditions takes into account many geographic factors. The delimiting of geographical regions, both domestic and foreign, for the conduct of sales campaigns has already been adopted by large manufacturing concerns. In foreign trade it is important to know the conditions which influence such things as types of architecture, kinds of tools employed, or styles in clothing and ornament used. So also is an appreciation of the methods of production and movement of crops, a knowledge of the conditions of transportation which locate centers of trade, shipping, and finance. The American business man and farmer would profit by knowing the conditions which determine the resources of his competitors and also their limitations. He should be able to estimate intelligently not only the present but the future strength of their competition.

It is apparent that so large and varied a body of detailed facts applicable to specific problems can not be acquired in a short time. The study of economic geography can, however, (1) open a great field for later enrichment by study and experience, (2) impart a geographic background against which a particular business may be viewed, (3) give a systematic method for the correlation and arrangement of facts regarding any business in its world relations, (4) provide a broad and enjoyable outlook upon the conduct of business and upon life, and (5) afford a foundation upon which there may be built a broad tolerance and sympathetic appreciation of the peoples and problems of the United States and of other lands.

PART I

THE UNITED STATES AND CANADA

Industries and Commerce as Influenced by Conditions of Geographic Environment

CHAPTER II

AGRICULTURE IN THE UNITED STATES AND CANADA

The Land a Fundamental Resource.—Productive agricultural land is the most valuable natural resource of most nations. The products of mines and of the ocean are dwarfed in importance when compared with the value of the products of the soil. In recent years the combined values of all the principal metallic ores, mineral fuels, and non-metallic minerals produced in the United States have not equaled the combined values of corn, cotton, and wheat, hay, and the other leading crops of the country. From the land man is fed and clothed, and the manufacturers who prepare foods and clothing for human use are as dependent on the farmer as they are on the miner who furnishes their motive power or on the capitalist who finances the business organization. Indeed, all industrial and commercial prosperity traces back to the land, for the farmer, at home or abroad, is the most important producer of foods and raw materials and a large purchaser of manufactured wares. In regions of limited size or in certain small countries, such, for example, as New England or Great Britain, the manufacturing industries may outrank agriculture in importance. Such industrial regions, however, are in large measure dependent on the farmers of other and non-industrial lands for their food, raw materials, and markets. It is safe to say that agriculture in its broad sense is much the most important of the world's major industries.

Permanency of Agriculture.—The soil, in comparison with the minerals, is a permanent resource. The economic minerals once removed from the ground are not replaced by nature. It is not to be understood from this comparison that the soil is inexhaustible, for some soils have been ruined almost beyond recovery by ignorant and wasteful methods of farming. In parts of China, however, careful management and intelligent methods of fertilization have maintained the productive capacity of the soil for thousands of years, and with proper use the soil of the world will no doubt remain the natural resource from which the people of the world will be supported long after iron and coal have ceased to be abundant.

Agriculture in America has not yet reached the settled maturity which characterizes it in the old world. Much of the land is new and is being robbed of its fertility through continuous cropping in wheat, cotton, or corn. This exploitive type of agriculture must eventually give way before better balanced systems of cropping which will maintain the fertility of the soil for future generations. More conservative methods of farming are already being widely practiced. They involve rotations of crops which are not merely changes from one crop to a similar one which requires the same element of fertility. Well-planned crop rotations alternate on the soil those crops which produce nitrogen and humus with those which consume the same substances; those which are deep rooted with those which are shallow rooted. When grains, grasses, legumes, and tilled crops are alternated in this way a type of agriculture develops which

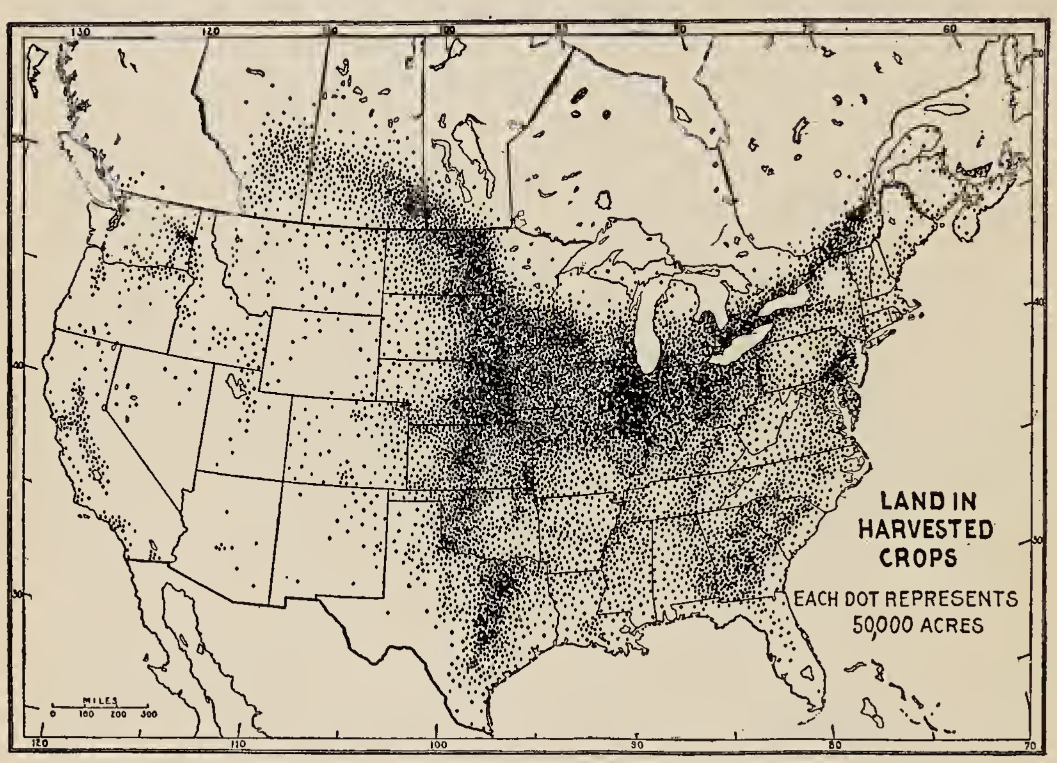


Fig. 1.—Land in harvested crops constitutes but a small part of the total area in the dry and mountainous West and on the glacially eroded surface of the Laurentian Upland.

(1) maintains a condition of good tilth in the soil, (2) keeps down weeds, (3) provides a basis for animal industries and for the return of animal manures to the soil, and (4) gives a diversity of products which lends stabilty to the farmer's income. All these conditions are essential to the progress of agriculture and to its permanence in America.

keeps down weeds
diversity of products which lends stability to farmer's income.

Factors Which Influence the Use of Agricultural Land.—Even a slight acquaintance with agriculture leads to the conclusion that regions are not all of the same productive capacity and that they are not all adapted to the raising of the same things. These differences result from the influences of many conditions some of which are inherent in earth environment. The more important and general of these environmental conditions are (1) differences in climate, (2) differences in location with respect to great consuming markets, (3) differences in the physical constitution and chemical composition of soils, and (4) differences in topographic situation. The broad dissimilarities in types of agricultural and pastoral industries found within areas of continental size are due in large part to differences in climate or in relationship to markets, while in limited areas, such as countries or small states, comparative uniformity of climate may give to soil or to topography the place of first importance as an influence in the geographical distribution of crops.

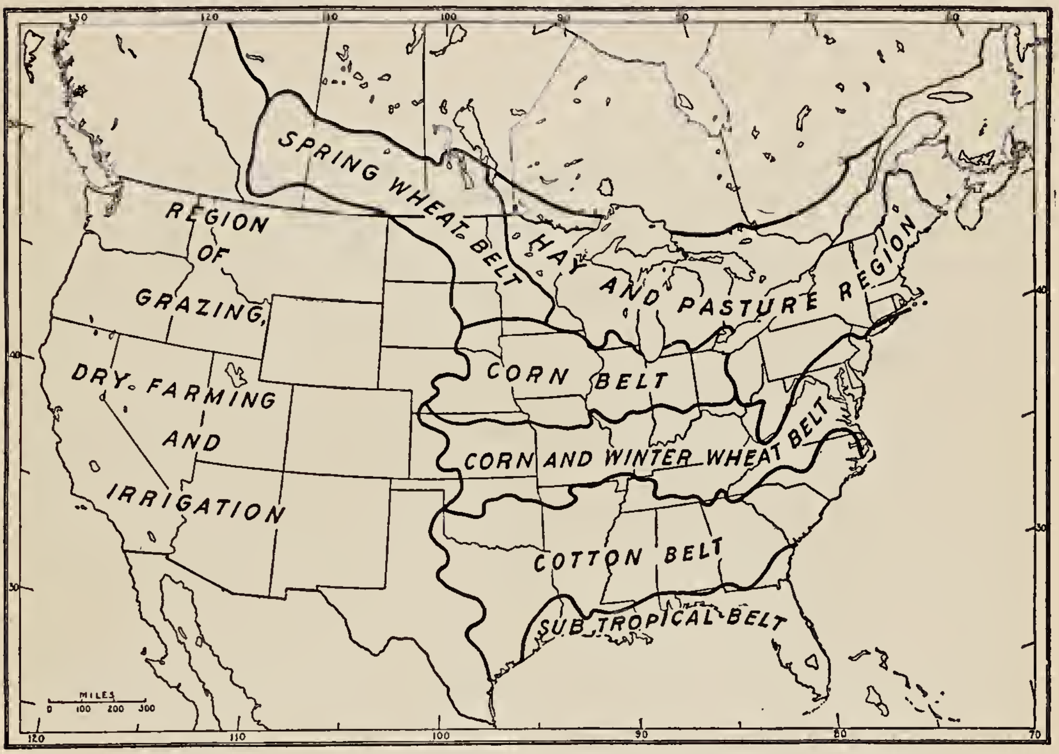

SPRING WHEAT BELT
REGION OF GRAZING
HAY AND PASTURE REGION
DRY-FARMING AND IRRIGATION
CORN BELT
CORN AND WINTER WHEAT BELT
COTTON BELT
SUB-TROPICAL BELT
MILES
0 100 200 300
130
120
110
100
90
80
70
40
30

FIG. 2.—The principal agricultural regions of the United States and Canada. (*After O. E. Baker*).

Agricultural Regions in the United States and Canada.—The United States and Canada may be divided into large agricultural regions among which there are fundamental differences in the principal crops grown or in the forms of agricultural or pastoral industry (Fig. 2). These differences are in large measure made possible or necessary by the above-mentioned factors of natural environment. Economic, social, and historical factors, such, for example, as the relative prices of competing crops or the cost of labor, are important also in influencing the use to which land is put. The characteristic features of the agriculture of each of the regions shown in Fig. 2 are briefly described below. Although conditions within these regions reflect the influence of natural environment, it is the agricultural use of the land which serves as a basis for the subdivision.

Agriculture in Eastern North America

The Hay and Pasture Region.—The agriculture of this extensive belt, which reaches from Minnesota eastward, centers on the abundant hay and forage crops. In limited districts in this region there are special crops, such as fruit, sugar beets, beans, and potatoes which claim a large share of the farmer's attention, yet the prevalence of cool, moist climates and the presence of large areas of poorly drained glacial soils or of rough topography gives to hay and pasture a widespread importance, as is shown by the fact that hay occupies one-half of the total area devoted to harvested crops (Fig. 3). Hay and pasture throughout the region are fundamental to the great dairying industry which finds its markets in the cities of this populous section. On the southern margin of the belt, corn and dairy by-products furnish subsistence for swine; corn silage supplements the hay and pasture, and the small grains round out the cropping systems and provide cash crops of some importance. The northern margin of the belt merges into the zone of northern forests, and includes large areas of cut-over and burned-over lands into which agricultural settlement is slowly moving. Some of this land is capable of agricultural development, but large areas will eventually be best utilized through reforestation.

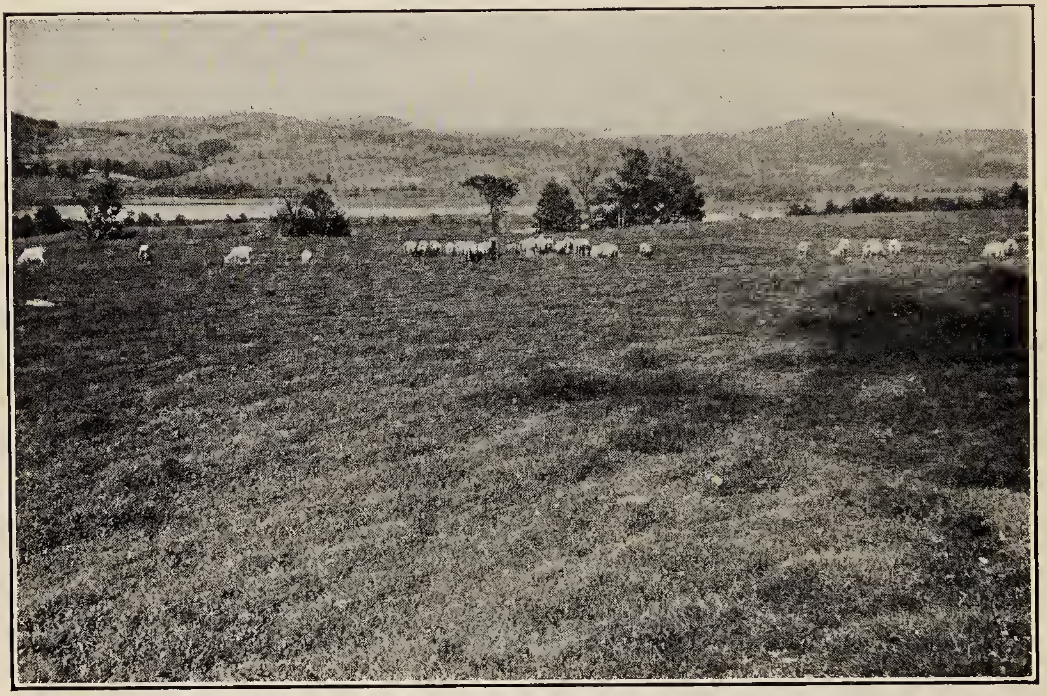


Fig. 3.—Pasture in New England. The thick carpet of grass in this humid region should be contrasted with the scanty covering shown in Fig. 6. (*U. S. Dept. Agr.*)

The Spring Wheat Belt.—The type of farming which gives unity to the spring wheat belt is that which centers on a limited group of spring-sown cereals, mainly wheat, barley, oats, and flax. Where conditions of climate permit or when prices are high, corn, winter wheat, and rye enter the crop rotation, but the cultivated grasses and the animal industries are of relatively small importance. It is distinctly a region of small grains grown by *extensive* agricultural methods. (1) The long cold winters and short growing season, (2) the relatively low rainfall, (3) the level topography, and (4) the fertile soils of the prairie lands are important factors in determining this system of agriculture. The products of the region are mainly sold and shipped away from the farm, and it is probable that the steady depletion of the soils which results from this practice will eventually enforce another type of farm management.

The Corn Belt.—Agriculture in the corn belt differs from that of the regions on either side of it in the dominating importance of corn. Conditions of soil and climate favorable to wheat production are found more commonly the world over than are those favorable to corn. Therefore, in this region, which is so eminently suited to the crop, corn is able to crowd out many crops which might otherwise grow there but which would compete with corn for the time and labor of the farmer. Corn is the basis of the great hog- and beef-feeding industries, and the usual price which pork and beef command makes corn the most profitable crop of this region. Yet other crops also are required for this purpose, particularly hay and oats. These crops fit well into a desirable crop rotation and into the labor condition of corn belt farms, and consequently they occupy more than one-half of the cropped land.

Several geographical conditions have combined to give to the corn belt a high proportion of tillable land: (1) the topography is the result of earlier glacial deposits, and is generally level or undulating; (2) there are widespread silt-loam soils of great depth and fertility, largely loessial, and generally much more easily drained than are those of the regions of newer drift; (3) the prairie sections were originally treeless, a condition which hastened the process of land improvement; (4) no part of the region is arid. The state of Iowa, nearly all of which lies within the corn belt, has 80 per cent of its entire area in improved farm land, while the average for the United States is 26 per cent, and the proportion in so old and well-peopled a state as Massachusetts is but 13 per cent. The *mixed corn and winter wheat belts* borders the true corn belt on the south and the line of separation is not sharply defined. Here wheat is the leading crop and the fattening of cattle and swine is a less intensive industry, though it is by no means unimportant.

The cotton belt is an agricultural adaptation to a combination of favorable climatic and soil factors which make cotton production profitable. It is the largest cotton region in the world, and the world's demand for cotton has caused a notable specilization in the crop in this region which is most capable of producing it. Other crops assume minor economic importance, although in acreage corn is nearly the equal of cotton in several states. Various factors are tending to increase the diversity of agriculture in the cotton belt; yet due to the limited climatic range of this all-important crop, the cotton belt is certain to remain one of the conspicuous economic regions of North America.

The Subtropical Coast Belt.—In this belt, which borders, the Gulf and Atlantic Coasts from Texas to South Carolina, the unifying feature is not the intensive development of any one crop or agricultural industry. It is rather (1) the subtropical character of the agriculture which is imposed by the climate, and (2) the relatively small percentage of improved land in farms, which is due to the wide extent of ill-drained land and to the prevalence of light, sandy soils.

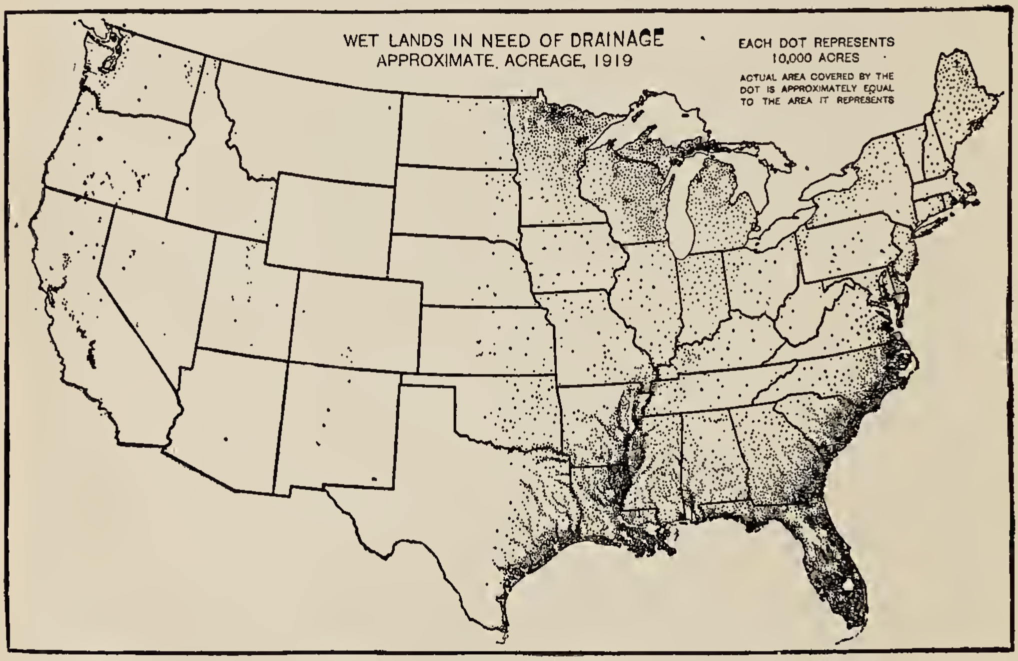

WET LANDS IN NEED OF DRAINAGE
APPROXIMATE ACREAGE, 1919
EACH DOT REPRESENTS 10,000 ACRES ·
ACTUAL AREA COVERED BY THE DOT IS APPROXIMATELY EQUAL TO THE AREA IT REPRESENTS

FIG. 4.—The largest total areas needing drainage are the swamps of the Atlantic and Gulf coastal plains and of the newer glacial drift. (*U. S. Dept. Agr.*)

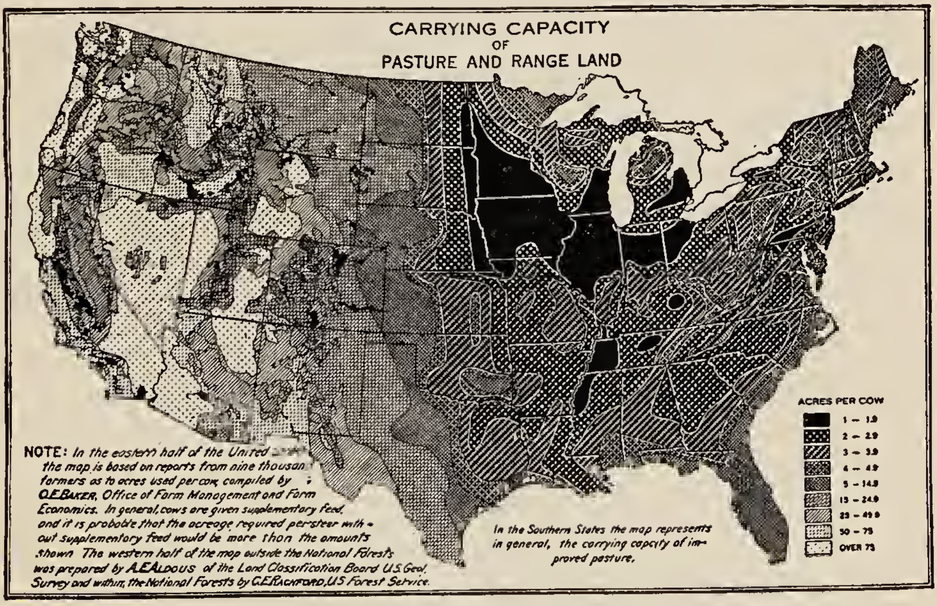
Climatic conditions give a subtropical character to the agriculture of the region, however, in that they permit the cultivation of such crops as sugar cane and the citrus fruits, and encourage the production of early fruits and vegetables for the northern markets.

Wet Lands in Need of Drainage.—Throughout the eastern half of North America lie areas of land which are unfit for agriculture without drainage. Figure 4 shows the extent of such lands in the United States. Their total area is nearly equal to that of Indiana, Illinois, and Iowa combined, and is nearly twice as great as the total area believed ever to be capable of irrigation in the arid sections of the country. The wet lands are of two types: (1) Two-thirds of the total in the United States consist of the tidal marshes, coastal plain, delta, and river flood plain swamps of the Atlantic and Gulf plains; a large part of these wet lands is forested; (2) one-third of the total is in the glacial swamps of the northern states and to this area should be added large areas of similar land in eastern Canada.

The reclamation of these lands by drainage is a problem which invites attention. In many regions the process will be difficult and expensive but will be justified; but even in the case of the more easily drained lands it is not clear that wholesale drainage projects are wise. The cost is large and the soils of the drained areas are often acid and lacking in one or more of the critical mineral elements of soil fertility, and are incapable of producing crops which, at present agricultural prices, would pay a reasonable return on the cost of the reclaimed land.

AGRICULTURE IN THE REGION OF GRAZING, DRY FARMING, AND IRRIGATION

The Grazing Lands.—In most of the vast region between the Pacific Coast and the eastern margin of the Great Plains the grazing industries made first use of the land. The prevalence of arid and semi-arid conditions of climate in this region limits all but a comparatively small portion of the land to that use. The grazing capacity of the unimproved land varies according to its climatic and topographic situation. On the humid margin of the Great Plains are pastures so good that 5 acres



NOTE: In the eastern half of the United the map is based on reports from nine thousan farmers as to acres used per cow, compiled by O.E.BAKER, Office of Farm Management and Farm Economics. In general, cows are given supplementary feed, and it is probable that the acreage required per steer without supplementary feed would be more than the amounts shown. The western half of the map outside the National Forests was prepared by A.E.ALDOUS of the Land Classification Board U.S. Geol. Survey and within the National Forests by C.E.RACHFORD, U.S. Forest Service.

In the Southern States the map represents in general, the carrying capcity of improved pasture.

FIG. 5.—The value of pasture land depends on its climate, soil and topography. (*U. S. Dept. Agr.*)

will support one cow (on the best corn belt land 1 acre of good pasture will support a cow). On the arid expanses of the western plateaus are many thousands of square miles where 50 to 100 acres or more per cow are necessary (Fig. 5). The utilization of the range lands depends in part also upon the topographic situation. In general the mountains furnish summer pasture. Cattle and sheep are driven into the mountain pastures, a part of which consists of open grass land scattered through the national forests. On the Great Plains and the Pacific Coast as well as the more humid sections of the western plateaus there is grazing throughout the year, though some additional feed is necessary in the winter. The desert lands furnish at best a scanty winter pasture, better for sheep than for cattle.

Less than one-half of the Western Range is privately owned and much of the grazing is on public land which is not subject to close regulation. Competition among the stockmen has resulted in the reckless overstocking of many areas to the serious damage of the stands of native grasses, resulting in the ruin of the land through rapid erosion or through the appearance of worthless or poisonous vegetation (Fig. 6).

Dry Farming.—Throughout the semi-arid sections of the great western region considerable acreages of grains and forage crops are raised by taking a chance that the rainfall of the season will be sufficient to mature the crop sown. In every year, however, there are districts where the necessary rain does not fall, most of these crops are never harvested, and the investment in seed and labor is lost. It is in such regions that dry farming is practiced.

Dry farming means the growing of crops on land which has been tilled in such a manner as to reduce evaporation and conserve moisture and to accumulate in the soil the precipitation of more than one year. This is accomplished by various means of tillage and crop management which require the investment of much more time and labor than are necessary in humid regions. In the drier sections it is possible to get a crop only every other year; in those of somewhat greater rainfall two crops in three years or even a crop every year are possible. (Agriculture of this type is adapted to a limited range of crops having relatively low water requirements. The land must be as carefully cultivated when it is not producing as in the seasons when a crop is obtained.) Dry farming can compete with the less careful agriculture of the more humid regions only by reason of the fact that it utilizes cheap land. When methods of dry farming applicable to American conditions were developed, much was expected of this form of agriculture. True, it has added somewhat to the agricultural land of the continent and it has yielded wealth to some individuals, but as a means of widespread utilization of the semi-arid lands and as a way of providing homes for a large additional population, it has proved a general failure.

Note

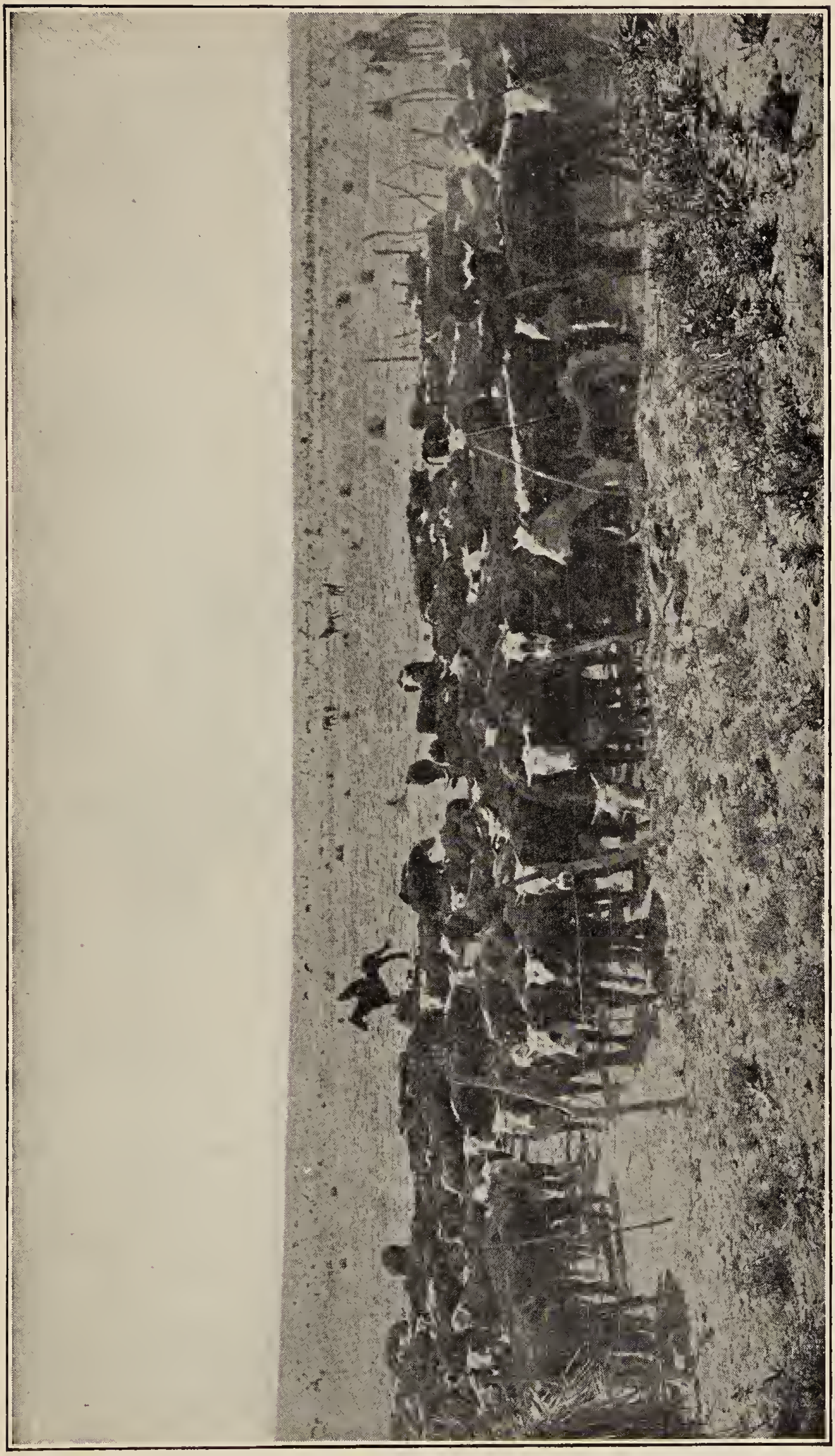


Fig. 6.—Western grazing range. The scanty forage shows the effect of drought and of over grazing. (*U. S. Dept. Agr.*)

IRRIGATION

The Need for Irrigation.—West of the Great Plains, north Pacific Coast regions excepted, the summer precipitation is generally insufficient for the growing of any but drought-resistant crops (Fig. 7), and intensive agriculture is possible only where water for irrigation is available.

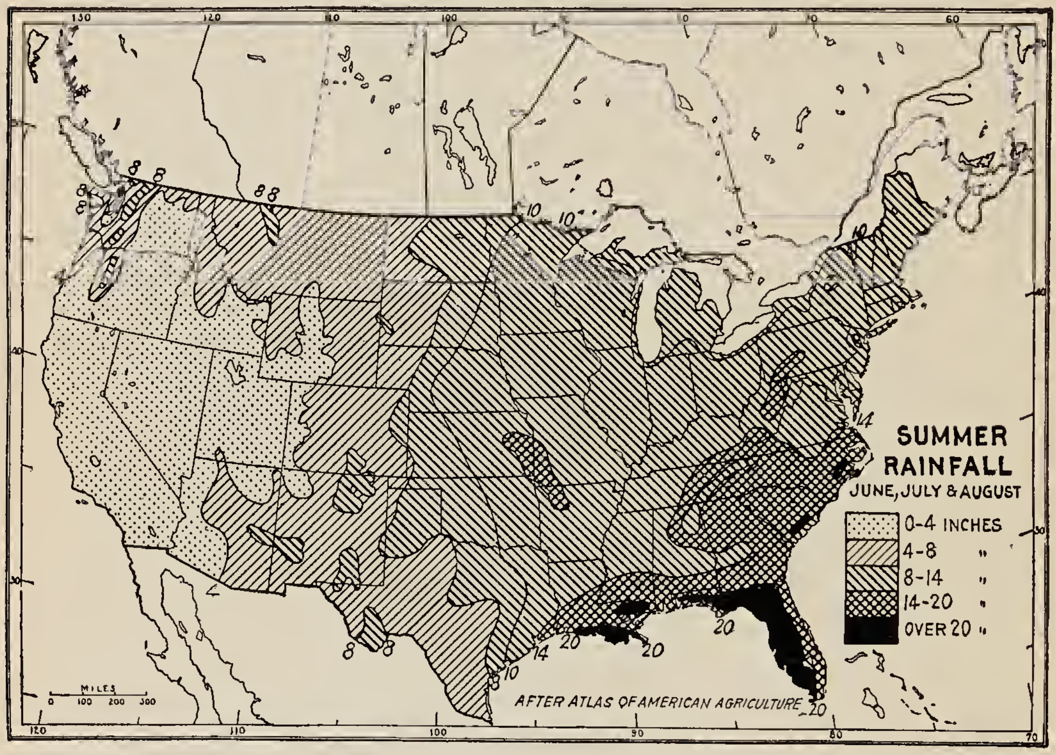

SUMMER RAINFALL
JUNE, JULY & AUGUST
0-4 INCHES
4-8 "
8-14 "
14-20 "
OVER 20 "
AFTER ATLAS OF AMERICAN AGRICULTURE
MILES
0 100 200 300
130
120
110
100
90
80
70
60
40
30
8
8
88
10
10
10
14
20
20
20
14
10
8
8
4
20

FIG. 7.—The quantity of summer precipitation is a critical factor in many aspects of agriculture.

Sources of Irrigation Water.—All the water which is applied to land in the process of irrigation is collected from the generally scanty precipitation of the surrounding region or from the drainage of mountain areas. It is evident, therefore, that only a fraction of the total area of the dry lands can ever be irrigated. Most of the water used is obtained from the surface drainage of the irrigated regions. Streams furnish three-fourths of the entire amount used in the country, while streams, springs, and lakes combined are the sources of 84 per cent of the total. Less than 10 per cent is pumped from wells constructed for irrigation purposes. The utilization of these waters involves expense (1) for the construction of dams and other works to raise the level of the water so that it may flow over the agricultural lands by gravity, or (2) for the installation and maintenance of pumping machinery for the elevation of the water. Due to seasonal inequalities in the flow of streams it is usually necessary to provide also for the storage of surplus water during periods of maximum stream discharge.

The Extent of Irrigated Land.—Figure 8 shows the general distribution of the irrigated lands of the United States. Their total extent in 1929 was over 20,000,000 acres, an area approximately that of the state of Maine. To this may be added a considerable area of irrigated land in western Canada. California, Colorado, and Idaho led in acreage under irrigation and, combined, had more than 50 per cent of the total.

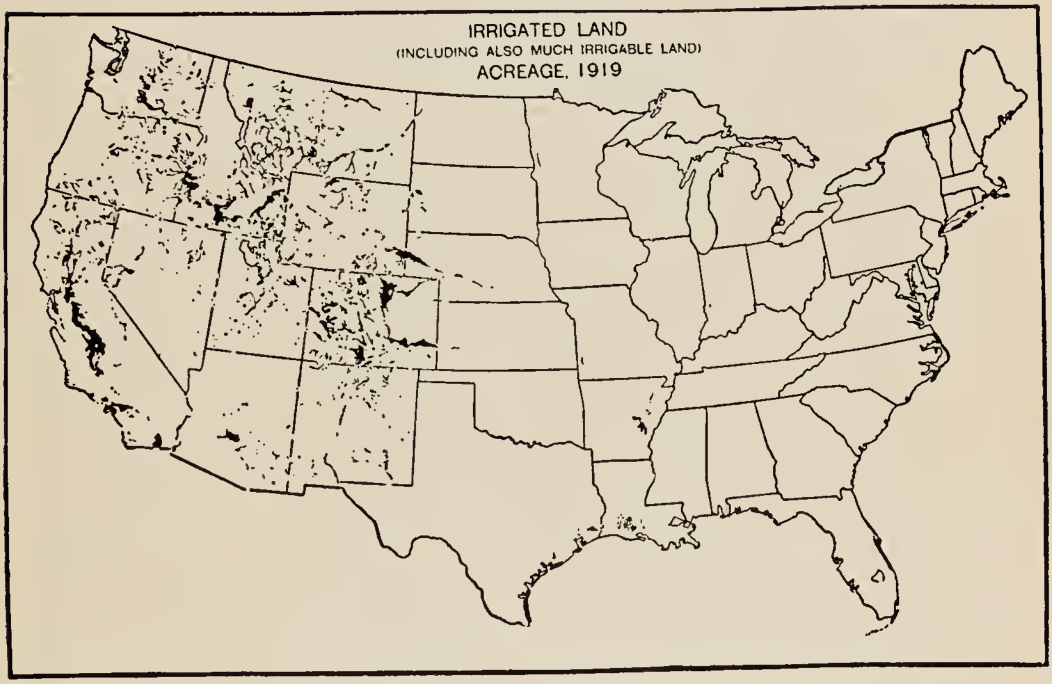


Fig. 8.—Irrigated land in the United States. (*U. S. Dept. Agr.*)

The established irrigation enterprises in operation at that date had sufficient water to supply an acreage 25 per cent greater than was actually under cultivation.

Types of Irrigation Projects.—Early settlers in the arid region found large numbers of small areas upon which irrigation water from mountain streams could be directed with comparative ease and little expense. Such are the private irrigation projects on many alluvial fans fringing the mountain ranges. Other projects of greater size and difficulty required local cooperation. As the more easily managed situations were utilized, those of increasing difficulty were undertaken by commercial organizations, by the states, and by the United States government. The accompanying table shows the percentage of the total irrigated area in the United States under each of the principal types of enterprise in 1919.

TYPE OF ENTERPRISE	PER CENT OF TOTAL IRRIGATED AREA
Individual and partnership	35.7
Cooperative	34.3
Irrigation district	9.5
Carey Act (state)	2.7
Commercial	9.5
U. S. Reclamation Service	6.5
U. S. Indian Service	1.5
City	0.2

Irrigated Crops.—The use of irrigated western lands for the growing of superior orchard and garden crops has led to a popular belief that these are the principal products of irrigated land. The leading irrigated crops are, in fact, the ordinary field crops. Hay and forage crops rank first in acreage, alfalfa being the most extensively grown (Fig. 9). The small grains, especially wheat and rice, are also important. The principal crops of the irrigated lands are therefore similar to and are in competition with crops grown without irrigation in the humid region. The advantages of agriculture under irrigation include (1) a closer regulation of the water supply than is possible under rainfall, (2) soils which ordinarily contain larger amounts of the soluble elements of plant food than do those of humid regions. The hay crops, particularly, give larger yields under irrigation than they do in the eastern states.

Problems Connected with Irrigation.—The difficulties of agriculture under irrigation are not past when a supply of water is provided in a position where it may be diverted to the land. Scores of miles of irrigation ditches must be dug; the land to be irrigated must be leveled, terraced, or otherwise fitted to receive the water. In many of the irrigation projects water seeps through the soil and collects in the lower ground bringing in solution some of the injurious salts abundant in some desert soils. The accumulation at or near the surface of these salts, known collectively as "alkali," calls for additional expenditures for drainage to wash out the alkali. It is estimated that about 15 per cent of the land under irrigation has been thus damaged by alkali, only half of which is provided with drainage facilities.

The Future of Irrigation in America.—Irrigation has added to the cropped area of North America, has increased the amount and variety of foodstuffs, and has provided homes and employment for many people. Yet the major part of these benefits comes from the large number of small private or cooperative irrigation projects; those on which irrigation was accomplished with the least difficulty and expense. The larger and later projects, particularly those undertaken by the United States government, have required large expenditures which impose heavy charges upon the farmers who occupy the land. Additional expenditures for drainage

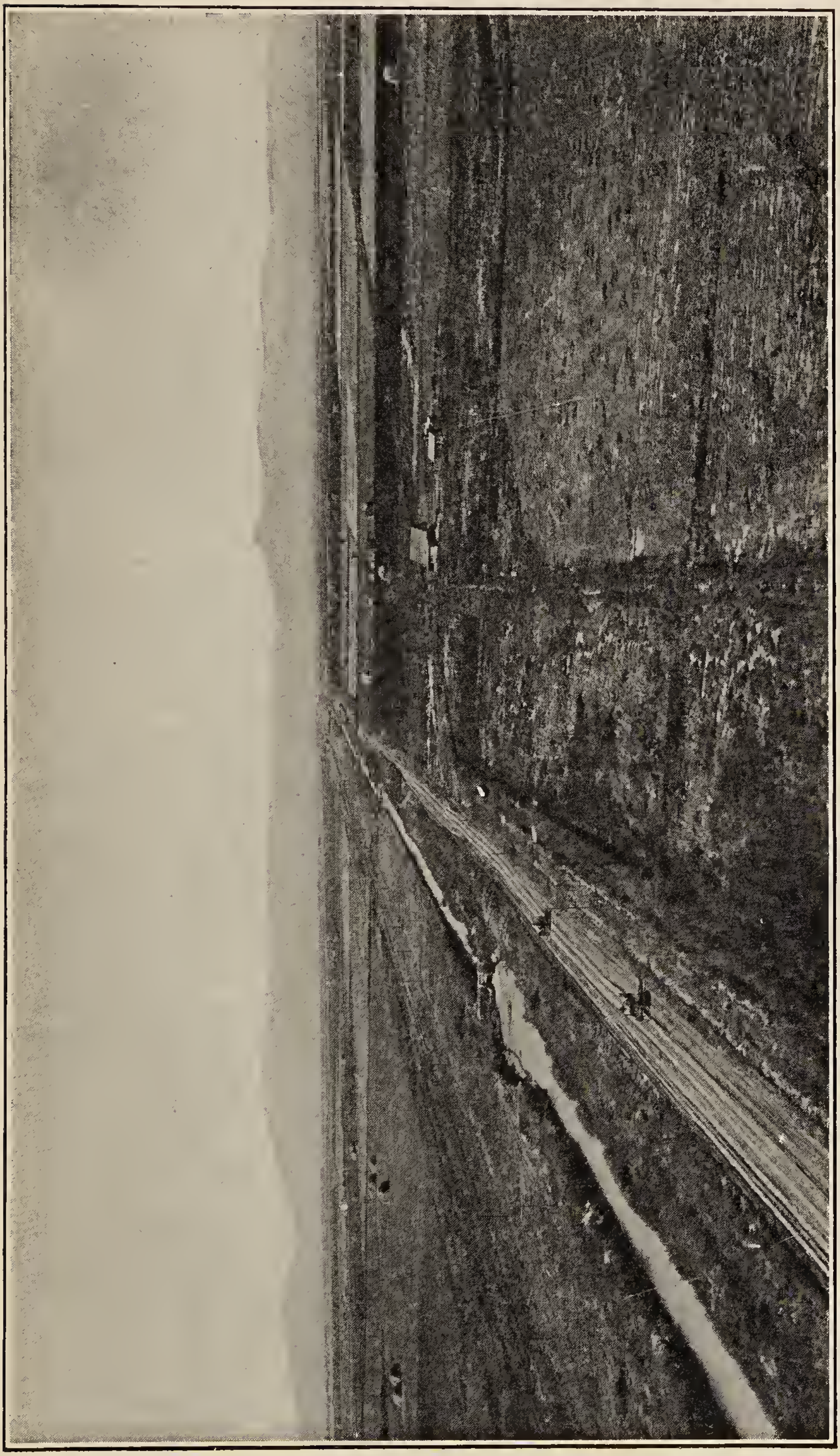


Fig. 9.—An irrigation project in Wyoming. Alfalfa is the principal crop. The homes do not look prosperous though they are spaced at intervals which indicate rather large farms. See Fig. 33. (*U. S. Reclamation Service.*)

appear likely in most of the projects as they grow older. The crops they produce do not in general greatly outyield those of humid regions. On few of the projects is the irrigable land fully occupied. On some of them, resulting from lack of experience, lack of capital, or from low prices, the settlers find little more than a mere existence. It may well be doubted whether new irrigation enterprises on a large scale are warranted until the humid lands shall be more intensively farmed and a period of permanently increased agricultural prices shall guarantee larger returns to the cultivator of irrigated land.

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CHAPTER III

GRAIN AND FORAGE CROPS

WHEAT

The World's Principal Bread Grain.—Wheat was known to the ancients and was cultivated at the beginning of written history in China, India, Southwestern Asia, and Egypt. It is believed to be native to the dry Mediterranean climate of Asia Minor or of Mesopotamia. The world's crop of wheat exceeds (in weight) that of any other cereal except corn and rice. Of all grains, wheat is best suited to the making of light bread because of the two proteins, glutenin and gliadin, which are contained in the seed. When wet, the proteins, particularly the gliadin, become sticky and tenacious, giving to the dough the "strength" which enables it to retain the gases produced by yeast fermentation and to expand with them.

Climate and Wheat Production.—*Temperature* conditions are highly influential in determining the yield and character of wheat and the limits of its regions of production. Wheat is a member of the grass family, and, in common with the other small grains, all of which belong to this family, it stools or tillers early in its growth by sending up additional stalks from buds near the root. Thus many heads are developed by a single seed. This process of multiplying stalks is aided by cool and fairly moist weather during the period of early growth.

More than 75 per cent of the world's wheat is winter wheat, sown in the autumn. This type of wheat finds favorable conditions for its early development during the cool weather of the autumn or winter and in the spring. In regions having mild and uniform winter temperatures, as in India and Mexico, the wheat grows more or less continuously all through the winter. Where winters are more severe, as in the central United States, the young plants lie dormant, protected by the covering of snow from excessive evaporation. In north central North America and in eastern Russia, winter temperatures and winds are so severe that fall-sown wheat is seriously injured and is not a successful crop. In these regions quick-maturing varieties, sown in the spring, and in this country known as "spring wheat," are more productive. Even the spring-sown wheats require no less than 90 days to come to maturity, and little wheat is produced where the growing season is shorter than 100 days. A cool, moist growth period followed by warm, bright summer weather permits the maturing and harvesting of the grain without damage from excessive moisture or fungus pests which cause discoloration and decrease its market value. High summer temperatures are not detrimental to maturing wheat where the atmosphere is dry, but when coupled with high humidity, heat favors the growth of fungus diseases and other pests which often make wheat culture unprofitable.

Relation to Rainfall.—Most of the world's wheat is grown in regions of relatively dry climate. The total annual rainfall most favorable to the growing of wheat is not easily determined because of the influence of temperature, rate of evaporation, and other factors. At present, little wheat is grown without irrigation in regions having less than 10 inches of rainfall, and most of the important wheat regions of the world have an annual precipitation not exceeding 30 inches.

The character of the wheat grain is much influenced by the amount and seasonal distribution of rainfall. In general, the grain of humid and of irrigated regions is soft and starchy and produces a "weak" flour, while that of drier land is harder and higher in protein. Kubanka, a drought-resistant and very hard (durum) wheat, obtained from the dry lands of eastern Russia, is now grown in the drier wheat regions of central North America. Its flour is used in the manufacture of macaroni and other alimentary pastes and for mixing with that of softer wheats for bread-making.

Note

Soils and topography have less direct influence than climate upon wheat production. In general, the best wheat soils of the world are heavy, dark in color and of high available fertility. Prairie soils usually have a high humus content and yield wheats having more protein than those grown in lighter soils. Level land is also highly favorable to the extensive type of farming by which much wheat is produced; it permits the use of machinery so necessary to modern wheat farming on a large scale.

Economic factors in wheat production have wrought great changes in a few decades. For 40 centuries wheat had been sown, harvested, and threshed in much the same way the world over. It is less than one century since the farmers of New York and Pennsylvania were sowing, harvesting, and threshing the principal part of the American wheat crop by hand labor. Since that time the invention of machinery has greatly reduced the human labor necessary to produce a bushel of wheat. The introduction of farm machinery and the improvement of transportation permitted the rapid expansion of wheat farming into the sparsely populated plains of central North America, South America, and Australia. An abundance of wheat not previously dreamed of followed and prices declined so much that many of the older and less favored wheat regions were forced to turn to other forms of agriculture.

Wheat Regions of the World.—Figure 10 shows the location of the world's great wheat-producing regions. It will be seen that eight areas

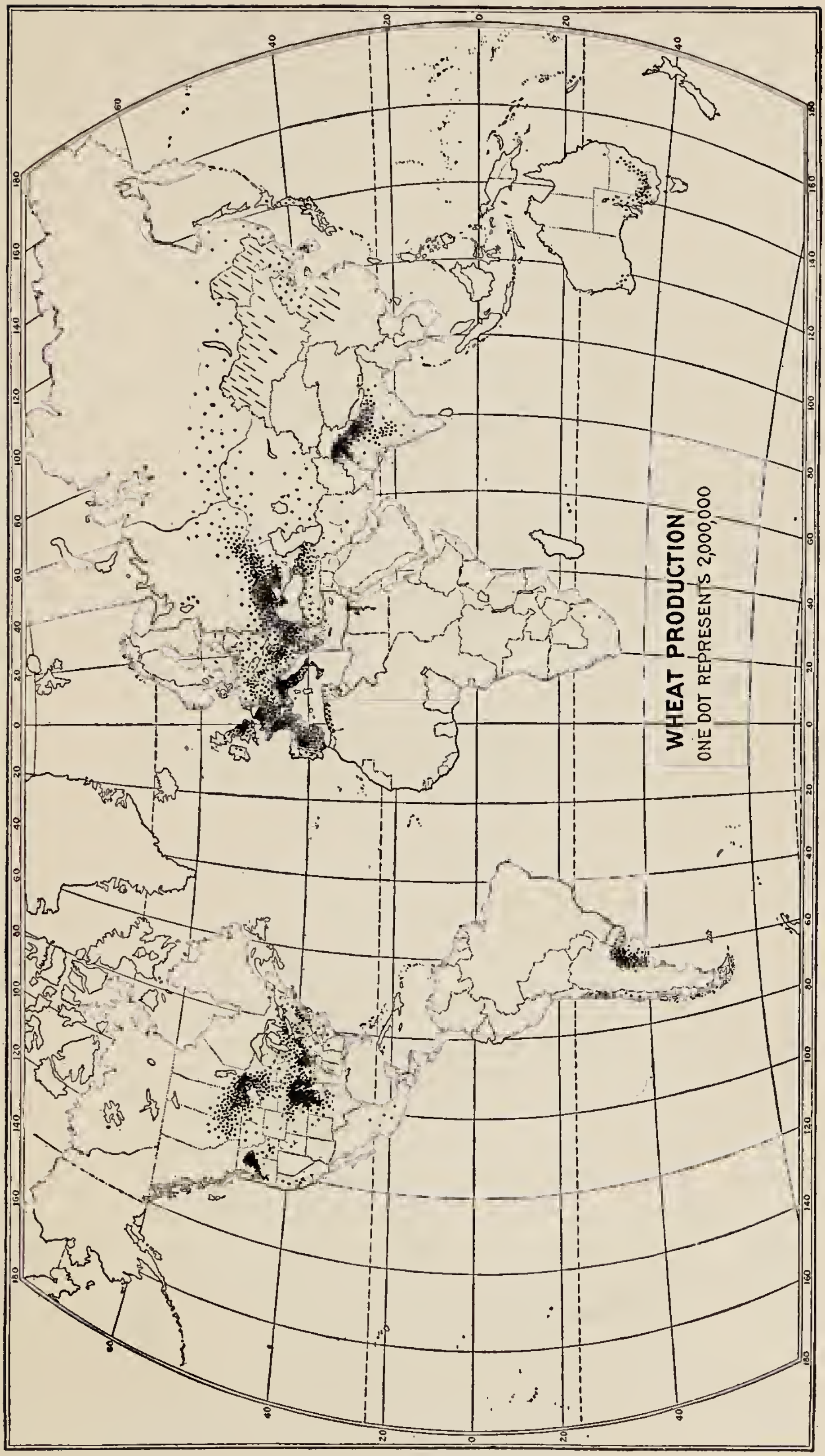

WHEAT PRODUCTION
ONE DOT REPRESENTS 2,000,000

FIG. 10.—The great wheat-producing regions of the world. Each dot represents 2,000,000 bushels.

stand out prominently. They are (1) central North America, (2) eastern Washington and Oregon, (3) northwestern Europe, (4) the Mediterranean countries, (5) the Danube basin and southern Russia, (6) northwestern India, (7) Argentina, and (8) southeastern Australia. The wheat production of Europe is normally equal to that of all the rest of the world, or nearly 2 billion bushels. Both the United States and Russia have each raised a billion bushels in a single year.

Wheat Regions of North America.—(Fig. 11.) Although the wheat-producing areas of North America are widespread, there exist rather well-defined limits imposed by geographical conditions. The eastern and central areas are separated from the far western by the aridity of the high plains and by the Rocky Mountains. Although considerable wheat is raised in this intermediate belt (1) on irrigated land, (2) by dry farming methods, and (3) by taking chances on the rainfall, the total quantity thus grown is not large. On the south, wheat production is limited (1) by the competition of the cotton crop, (2) by damage due to the freezing and thawing of open winters, and (3) by the insect and fungus pests fostered by the heat and humidity of the southern autumn, spring, and summer. On the north the central wheat region terminates at the margin of the rough land and the rocky soils of New England and the Laurentian Upland. In central Canada, level land and prairie soil extend far to the northward; here the limit of wheat production is not yet reached, but

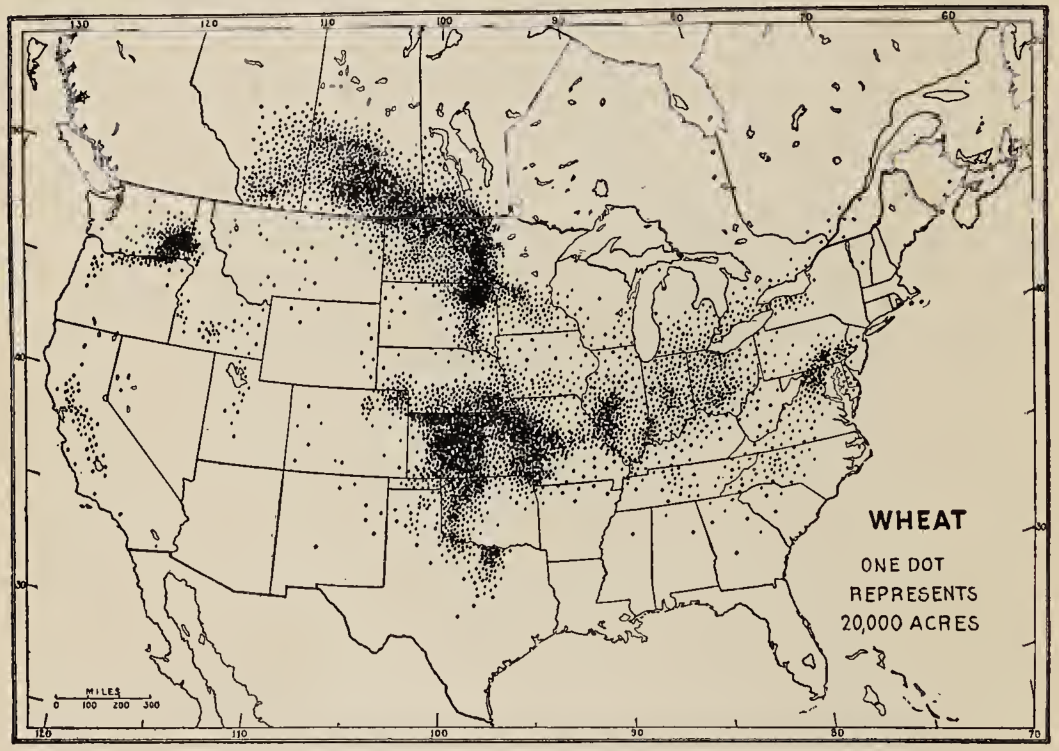


Fig. 11.—The three important wheat-producing regions of North America.

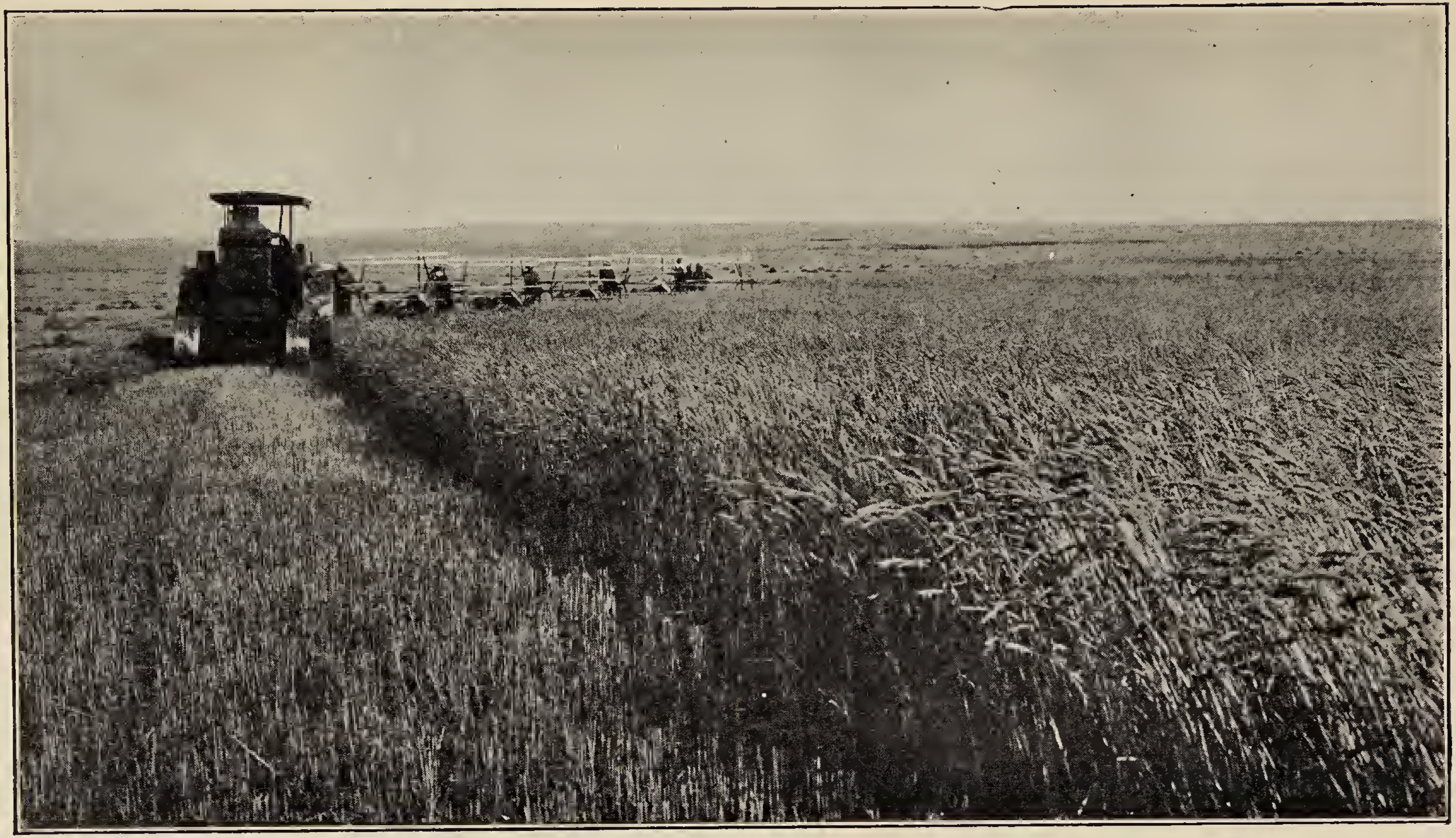


FIG. 12.—Spring wheat in the Prairie Provinces of Canada. Broad, level fields and sparse population encourage extensive methods of agriculture. (*Courtesy of the Northwestern Miller.*)

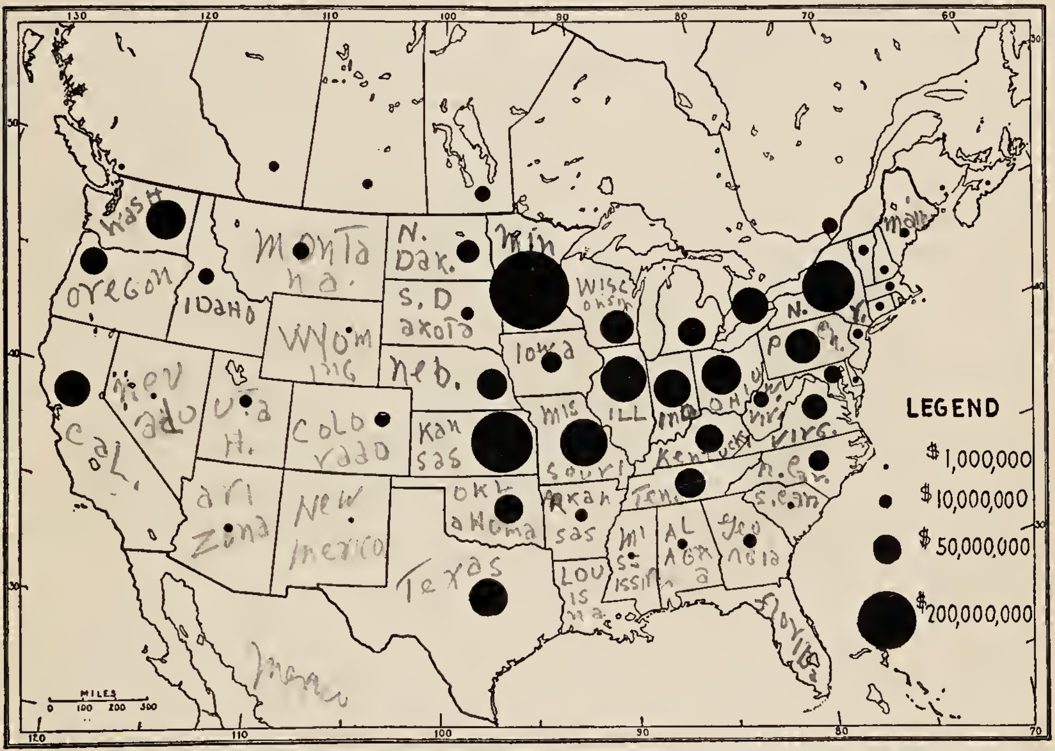
the crop continues to creep slowly toward the Arctic Circle, retarded, however, by the shortness of the growing season (Fig. 12).

The great central wheat region is divided into spring wheat and winter wheat districts by a line running directly west from Chicago. North of this line the dry and severe winters of Minnesota, the Dakotas, and central Canada create one of two great spring wheat districts of the world (the other is found in eastern Russia). South of this line and east of the Great Lakes little spring wheat is grown. The winter wheat belt extends from central Oklahoma, Kansas, and Nebraska eastward to central New York and eastern Maryland. It includes many areas where wheat is of minor importance because of the local competition of corn and other crops and because of the rough topography of the Appalachian highland. In the wheat region of the Columbia Plateau (Washington, Oregon, and Idaho) both winter and spring wheats are grown.

The character of the wheats raised in various sections of North America is much influenced by climatic and soil conditions. In the drier note climate and blacker soils which prevail west of the Mississippi, both the winter and spring wheats are harder and higher in protein than those of the East. In the wheat regions of the Pacific Coast and the Columbia Plateau, the grain is generally light colored and starchy due to the low humus content of the soils and to cool weather or moisture; this is particularly true of wheat grown under irrigation.

Transportation of Wheat.—In the early history of American wheat production the insufficiency of transportation made it necessary to raise most of the crop near the region where it was to be consumed. Expansion into the wheat regions of the present came with the development of railways and improved water transportation.

The volume of grain now produced in many counties in the wheat belt reaches into the thousands of carloads. This great traffic constitutes a problem in transportation which requires special methods of storage and handling. As a result, elevators for primary storage have been erected along the railways, and greater elevators have been built at railways centers and terminal points between the wheat regions and the eastern markets. Such centers are found in Winnipeg, Fort William, and Port Arthur, Canada; Duluth, Minneapolis, Milwaukee, Chicago, Kansas City, and St. Louis. The service performed by the elevators is not merely that of storage awaiting a favorable market, but the grain is usually cleaned and graded while in storage and its market value is thus increased. note Although a large quantity of American wheat moves to its final destination by rail, water transportation is also an important factor. The position of the Great Lakes waterway between the spring wheat region and the large eastern centers of population and commerce is of great economic advantage. Wheat is so easily handled in bulk with modern appliances that transportation by boat is highly efficient. A large part of the spring wheat and some winter wheat is moved by water from the ports on Lake Superior and Lake Michigan to both Canadian and United States ports on Lake Huron and Lake Erie and even to Montreal and New York. The Lakes are closed by ice within two to three months after the spring wheat crop is ready to move, which makes it the more necessary for the ports at either end of the route to provide elevators to handle the large volume of grain suddenly poured in upon them. The storage and marketing of Columbia Palteau wheat through the northern Pacific ports are made somewhat easier by the prevalence of dry summer weather.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LEGEND
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MILES
0 100 200 300
Wash
Oregon
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Wisconsin
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Wyoming
Nevada
Uta H.
Colorado
Cal.
Kansas
Missouri
Ill
Ind
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W. Vir.
N. Car.
S. Car.
Ten.
Arkansas
Oklahoma
Texas
Louisiana
Missi ssippi
Alabama
Georgia
Florida
Arizona
New Mexico
Mexico
Maine

FIG. 13.—Comparative values of flour manufactured in various states and provinces. American flour-milling centers of greatest importance are situated between the wheat regions and the consuming or exporting markets.

The Manufacture of Wheat Flour.—There are approximately 4,000 flour mills in the United States and over 500 in Canada (Fig 13). About one-half of the flour, however, is ground by 1,000 mills of large capacity. Small mills are continually being abandoned because of the competition of the larger, better situated, and more efficient establishments. (These large mills are located (1) at centers of transportation near the region of wheat production, or (2) in the region of consumption where efficient transportation brings wheat to their doors at low cost) The great mills of Minneapolis, Kansas City, and Seattle illustrate the first type of location. In the case of Minneapolis the Falls of St. Anthony furnished an

(3) in places where there are low handling costs. The [illegible] [illegible] [illegible] [illegible] [illegible] [illegible])

original incentive to the location of this industry with which water power has always been so closely associated. The large milling interests of Buffalo, N. Y., and Port Colborne, Ont., show the influence of cheap transportation of wheat in bulk upon the Great Lakes to these eastern manufacturing centers. Intermediate in geographical position between these extremes are many mills of large capacity, such as those of Indianapolis and Toledo. These mills draw in part upon local supplies of the grain, but also upon the wheat of the western states. Modern flour milling is not the simple process which characterized the making of flour a few generations ago. This is due not alone to the character of the machinery used, but also to the character of the grain. The widely sold patent flours must maintain uniform chemical composition and baking qualities. For bread flour, hard western wheat may be used alone or modified by blending with softer eastern or Pacific Coast wheat. Therefore, eastern mills often buy western wheat and western mills use wheat from the more humid regions. The starchy wheats of the East and of the Pacific Coast region are used in part also for the manufacture of pastry flours and for breakfast foods.

The Baking Industry.—Home baking still consumes the larger part of the flour produced in the United States and Canada. There is, however, a constant increase in the use of flour in baking establishments, large and small. These are found mainly in cities where congestion of population has created a large local market for bread and other bakery products. Rapid transportation has enlarged this market by enabling the city bakery to send its product daily to the smaller towns of the surrounding region.

Another phase of the industry is the preparation of macaroni, noodles, crackers, breakfast foods, and other cereal products, many of which require other raw materials than wheat flour. The manufacturers are not dependent upon the local market for the sale of their products because these are of relatively high value and are not perishable. The location of such industries, as in Battle Creek, Mich., or Niagara Falls, N. Y., is due to accident or some chance association more than to any special advantage of situation. The commercial baking industries of the United States consume nearly half of the flour output of the country.

American Foreign Trade in Wheat.—Exports of wheat and flour from the United States average about one-fourth the quantity produced. The quantity available for export depends upon the balance of the crop remaining in the United States after providing for a normal per capita consumption of 4¼ bushels, and a total of more than 100 millions of bushels for seed. The small population of Canada enables that country to export three-fourths of its wheat crop, some of which is consumed in the United States. The great market for the exportable surplus of North American wheat is in the densely peopled countries of western

Note

Europe (Fig. 14). It follows that the flow of wheat is mainly through the various eastern ports, from Montreal on the north to Galveston on the south. The principal grain ports, Montreal, Portland, Me., New York, Philadelphia, Baltimore, Newport News, New Orleans, and Galveston are mechanically equipped for the rapid transportation of grain from cars to the ship's holds.[1]

In order to take advantage of the shorter northerly route between the Canadian wheat region and the European market, the Canadian government has constructed a railway from Winnipeg to Fort Churchill on Hudson Bay. Transportation of grain by this route will, however, have geographic handicaps which may offset the advantage of shorter distance.

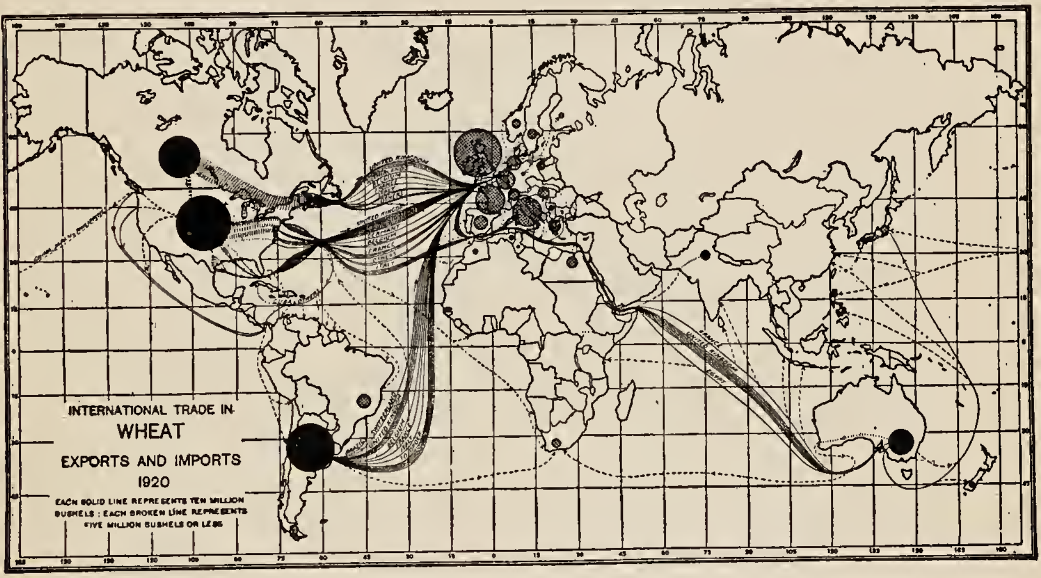
INTERNATIONAL TRADE IN
WHEAT
EXPORTS AND IMPORTS
1920
EACH SOLID LINE REPRESENTS TEN MILLION BUSHELS ; EACH BROKEN LINE REPRESENTS FIVE MILLION BUSHELS OR LESS

Fig. 14.—The flow of the world's surplus wheat is toward the industrial countries of western Europe. (*U. S. Dept. Agr.*)

Much of the surplus wheat from the Columbia Plateau moves to both domestic and foreign markets through the ports of Puget Sound and the Columbia River. Ships laden with wheat and flour from Seattle and Portland cross the Pacific, or traverse the Panama Canal bound for Europe or for the domestic markets found in the ports of eastern United States.

The demands of the growing industrial population in the United States had, prior to the World War, resulted not only in a general decrease in wheat and flour exports but in considerable importation of foreign wheat. These imports came mainly from Canada, but also from the great wheat fields of the southern hemisphere.

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[1] Such equipment includes storage elevators with pneumatic tubes for unloading grain and with belt conveyors or other devices for discharging into the ship.

The Future of North American Wheat Production.—The use of white bread is associated with a comparatively high standard of living. It is consumed mainly in the industrial countries of western Europe and in the new, sparsely settled, and prosperous countries of the world. All of these areas have increased greatly in population during recent decades as a result of settlement and of industrial development. During the same period the discovery and opening of new and easily exploited wheat lands has ended. These facts have led many to wonder whether the future supply of wheat will be great enough to meet the demands put upon it. It is not possible to answer that question now, yet it is certain that the wheat crop of North America and probably of other continents will be increased in the future. Whatever these increases may amount to, they will result from conscious effort along several lines. (1) Yields per acre may be increased by more intensive agriculture involving more general rotation of crops in the wheat belts. The average yield of wheat in the United States is about 14.5 bushels per acre, and the yield is below that average in several of the most important wheat-producing states. (2) Regions now given over to specialization in other crops, such as corn or hay, may include more wheat in their crop rotations, thus increasing the wheat area. (3) The increase of land under irrigation may add a little to the total wheat acreage. (4) Experiments in plant breeding and selection may produce (*a*) higher yielding varieties, (*b*) varieties more resistant to disease and to drought, (*c*) varieties adapted to shorter growing seasons. (5) Exploration and plant introduction may furnish varieties with similar possibilities. Although wheat is not easily modified by breeding, numerous experiments show that much can be done by selection. In Kansas a variety, called Kanred, has been developed by selection from a single head of wheat brought from southern Russia in 1900. It has been found to have great winter hardiness and superior rust resistance under Kansas conditions. Not until 1917 was the strain sufficiently perfected to be widely distributed. In 1920 it was grown on about 500,000 acres and was so generally satisfactory that in 1921 about 3½ million acres of it were sown and harvested. Increases in our supply of wheat from any or all of these causes will be slow, but perhaps as rapid as the increase in demand, and it is not likely that any great, permanent world shortage of wheat will occur in the near future.

Rye

Rye an Important Bread Grain.—Rye ranks next to wheat in importance as a bread grain. It belongs to the same cereal group and has many of the same plant characteristics. Rye contains sufficient protein to make a flour of moderate strength and is nearly the equal of wheat flour in food value. It is, however, darker in color and possessed of a peculiar flavor which makes it less desired. The world's rye crop averages nearly half that of wheat, and almost the entire crop is produced and consumed in Europe.

Adaptation to Climate and Soil.—Rye is distinctly a crop belonging to cool, moist climates. It requires more water than wheat, and will endure more severe winter conditions. While rye, like wheat, yields best on a fertile soil, it will yield much more abundantly than wheat on poor, acid, or marshy lands. These conditions of adaptation to climate and soil are important influences in the distribution of the crop in North America and also in Europe.

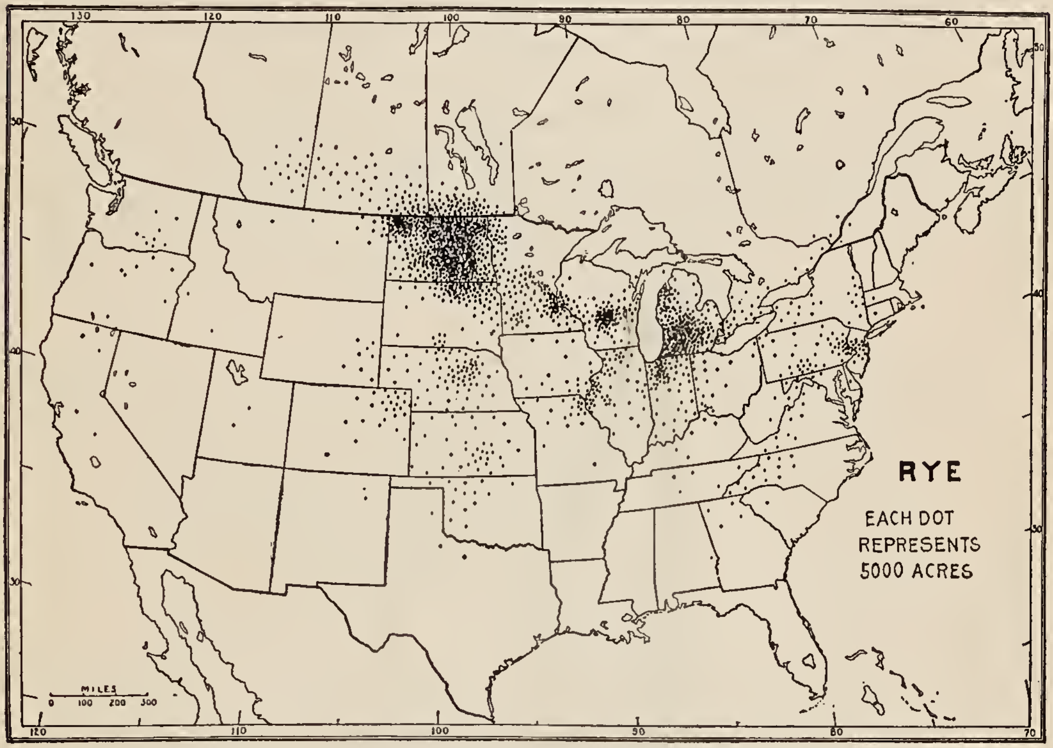

FIG. 15.—The American rye belt is situated to the north of the winter-wheat belt and, in part, on poorer soils.

Areas of Rye Production.—The rye crop of North America is less than one-tenth as great as the wheat crop. It is grown principally as a winter grain in the spring wheat belt and in an area extending eastward through central Minnesota, Wisconsin, and Michigan, into Ontario and Quebec. This eastern region is that of most recent glaciation in which there are large areas of poorly drained glacial swamp and marsh land, with acid soils. In part also, this region is underlain by ancient sandstones which have contributed much of their material to the glacial drift, resulting in light and relatively infertile soils. It is clear from a comparison of Figs. 15 and 11, that the rye belt lies to the north of the winter wheat belt and on its cooler and more humid margin. (Compare also Figs. 283 and 197.)

In eastern Pennsylvania, New Jersey, and adjacent parts of New York rye competes with wheat for the good soils. In this region, however, value is added to the crop by the sale of the long, tough straw which is in demand for packing purposes. In other parts of North America rye is grown but not harvested for the grain. On the Pacific Coast it is one of the grains which is grown during the winter rains and later cut for hay. In the South it is grown as a cover crop to reduce winter soil erosion. In New England and also in other regions, young rye is often plowed under as a green manure in the process of recovering fertility in worn-out soils.

Barley

Barley a Short-season Grain.—Barley, like wheat and unlike rye, is believed to be native to the dry lands of southwestern Asia. Its general range of present cultivation is similar to that of wheat, except that some varieties are grown in small quantities beyond the poleward limit of wheat cultivation in the northern hemisphere, and others beyond the minimum rainfall limit of wheat culture in the dry subtropics. This great geographic range of barley is due not so much to its ability to withstand cold and drought as to the shortness of its growing season which enables it to mature quickly and thus to escape unfavorable weather conditions whether they be early autumn cold or summer drought.

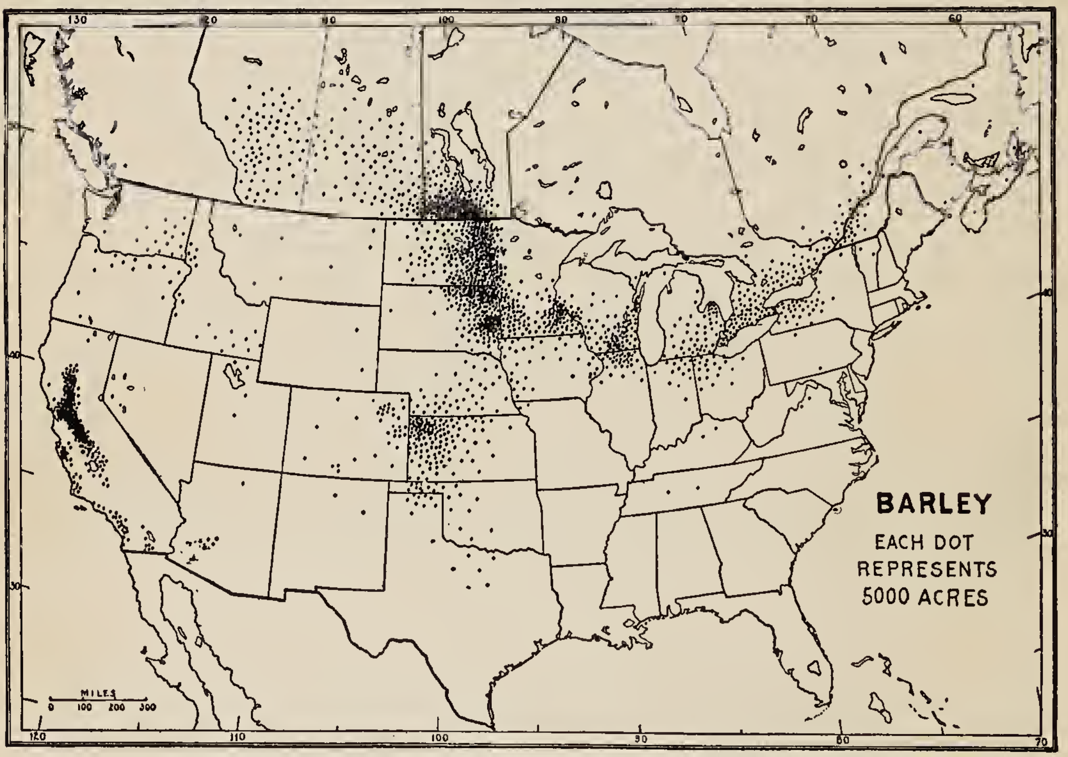

Fig. 16.—Barley is a spring-sown crop in the North and East where winters are cold but a fall-sown crop on the Pacific Coast where summers are dry.

Barley is like wheat also in that it gives satisfactory yields only on soils of relatively high fertility. It is, however, more tolerant of alkaline soils than wheat. Although barley is used for food in parts of the old world, it does not make a light bread, and is cultivated mainly for animal feed, for malting, and to some extent for hay.

Barley in North America.—North America produces less than one-sixth of the world's crop of barley. This grain is raised in small quantity, together with spring wheat and oats, as far north as central Alaska where it sometimes matures in 80 days. Due to its short season of growth and its resistance to soil alkali, it is used as a dry-land crop on the High Plains and on the Pacific Coast where it is an important crop both for its hay and for its bright grain, much of which is exported to European brewers. The principal barley region of North America (Fig. 16) is nearly coincident with that of spring wheat, except that it continues eastward through Minnesota and Wisconsin into Michigan. This region lies on or beyond the northern border of the corn belt, and the barley frequently enters into a rotation with wheat.

OATS

Adaptation to Climate and Soil.—Oats have many of the plant characteristics common to the other cereals. Like rye they are most important in regions of relatively cool, moist climate. Unlike rye, however, they are not very resistant to winter condition and are grown almost entirely as a spring-sown crop.

Most of the varieties of cultivated oats originated in Europe, and each is adapted to the combination of moisture and soil conditions characteristic of the region of its origin. In general they require more water than wheat or barley. The pendant form of the head and the larger outer seed-covers doubtless protect the flowers from rain and also render the matured oats somewhat less subject to damage and discoloration by moisture than are wheat and barley. These facts are reflected in the high relative importance of oats in the cool, humid cereal-producing regions of the world, such as Scotland, Scandinavia, and eastern Canada.

Uses of Oats.—Oats are more widely grown in North America than any other cereal. On the Gulf Coast and in the southern states they are fall-sown. On the Pacific Coast they are grown to a limited extent for hay. In New England and eastern Canada they are important because of their adaptation to cool, moist climate. The principal region of oats production is, however, nearly coincident with the corn belt (Fig. 17). It will be recognized that this region has not in all respects an ideal oats climate, for it is often warm in the early summer, a condition which is conducive to fungus diseases of oats. The high fertility of the soil frequently causes a rank growth of straw, and the violent storms of early summer cause the crop to be badly blown down and lodged. Some of these environmental handicaps have been in part overcome by the introduction of new varieties from the steppe lands of eastern Russia.

The primary reasons for the great importance of oats in the corn belt are economic rather than geographic. (1) The seeding and harvesting times for oats fit well into a rotation with corn. (2) Oats, because of their high protein content, are desired as a feed for horses, and, ground with corn, for feeding young meat-producing animals. (3) Oats straw is somewhat softer, more palatable, and has a higher feeding value for animals than the straw of other small grains.

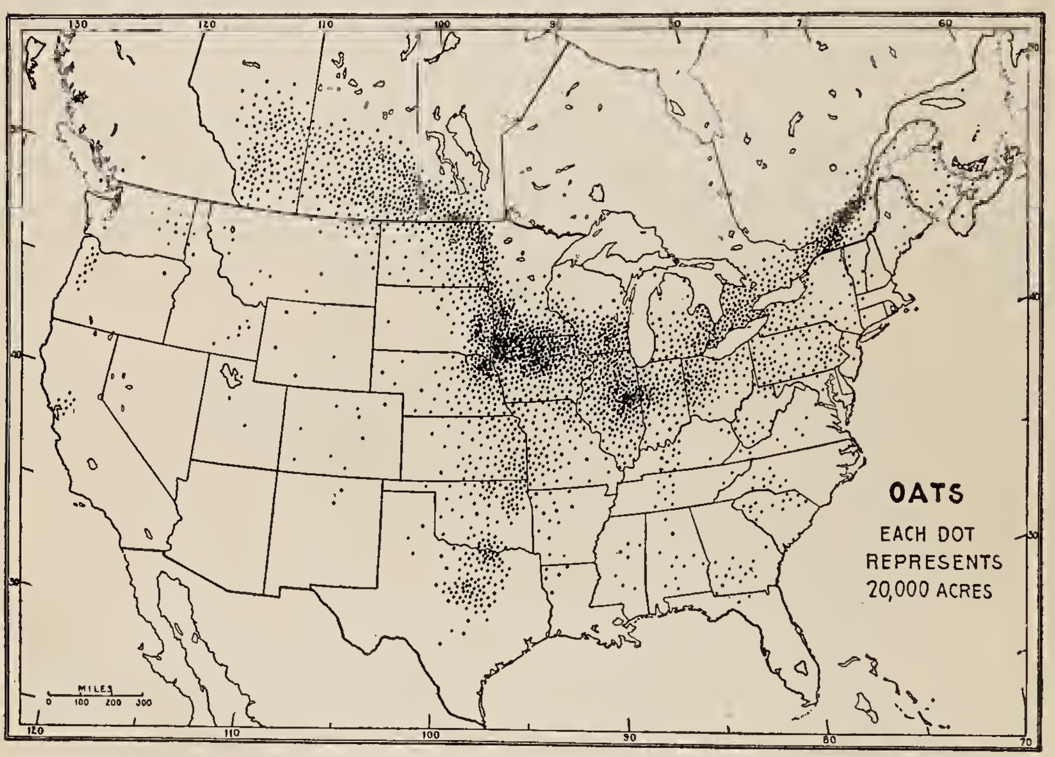

Fig. 17.—Oats are grown in the corn belt and also in the cooler North and the more humid East.

The United States and Canada raise more than one-third of the oats of the world. Of this vast quantity the major part is consumed on the farms. Considerable quantities are shipped to the cities for feeding horses and to mills where rolled oats and groats are prepared for human food. The large bulk and relatively low value of oats makes ocean shipment expensive. Normally less than 2 per cent of the United States crop and about 10 per cent of the Canadian crop enters into foreign commerce.

Rice

The Plant and Its Environment.—Rice is a cereal that thrives in tropical and subtropical swamps and may be profitably grown only where abundant water can be provided. It is most important in southern and eastern Asia where more than 95 per cent of the world's crop is raised. Of the small producers in other lands, most are inconspicuous and only in Madagascar, Italy, and the United States is the amount significant. In the case of the United States it is rather the modern method by which rice is produced than the relative volume of the crop which is worthy of note.

Geographic Conditions Favorable to Rice.—The subtropical character of rice is reflected in the length of its growing season. Of the many varieties of rice some will mature in as little as 150 days, but in the principal rice regions of the United States the growing season is from 180 to 200 or more days. Temperature conditions, therefore, limit American rice culture to the region south of the Ohio River and to the Pacific Coast.

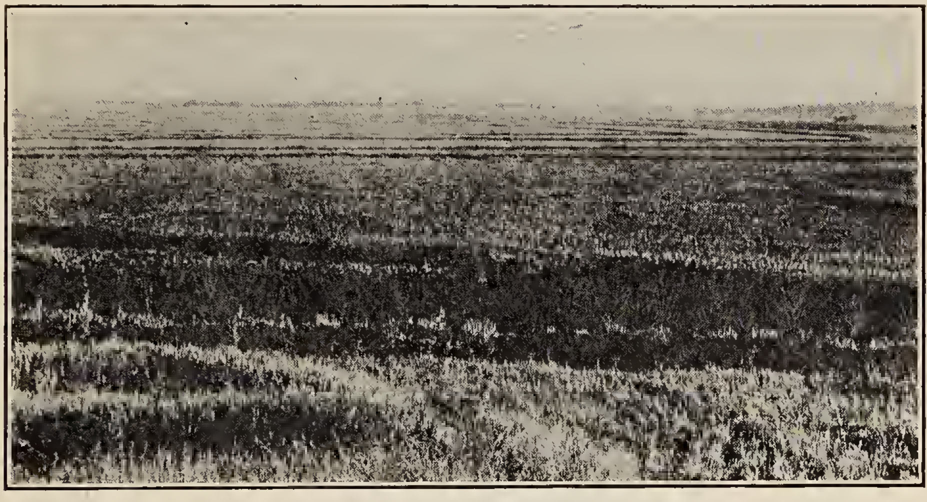

FIG. 18.—Rice fields on the level coastal plain of Texas. The dark lines are the artificial contour levees used to retain the irrigation water. (*U. S. Dept. Agr.*)

More critical, however, than conditions of temperature is the requirement of rice for moisture. It demands swamp conditions and during a considerable part of its growth it must be flooded, requiring a total of 45 to 65 inches of water during the period of growth. In the Orient this is supplied in large part by the abundant monsoon rains. In southern United States only about 20 inches of rain falls during the growth period and from 25 to 30 inches additional must be supplied by irrigation. In the drier climate of California about 60 inches of irrigation water are required.

Level fields are essential to rice production. The flooded land must have a uniform depth of water from side to side, and at no time must it exceed 6 inches. In the Orient, hillsides are terraced to secure tiny level fields, but in America small fields are impracticable, since they are not adapted to the use of machinery and their requirement for hand labor can not be satisfied. The principal areas in the United States having the necessary conditions of climate and topography are found on the borders of the Atlantic and Gulf coastal plains and in the valley of California. Here great areas of gently sloping land are divided into fields by low embankments 10 feet wide and a foot high. The embankments, constructed on contour lines, enclose level fields of 1 to 100 acres, and are so low that machinery is driven over them as if they did not exist (Fig. 18). Under such conditions gang plows, seeders and harvesters can be used as for wheat, and the cost of rice production is much reduced. The use of such machinery requires firm land, however, and for that reason the topography must have sufficient slope and the natural water courses must be sufficiently free to permit rapid and thorough drainage at the proper time. It is also necessary to keep the water on the fields in slow circulation to avoid stagnation during the growth of the crop.

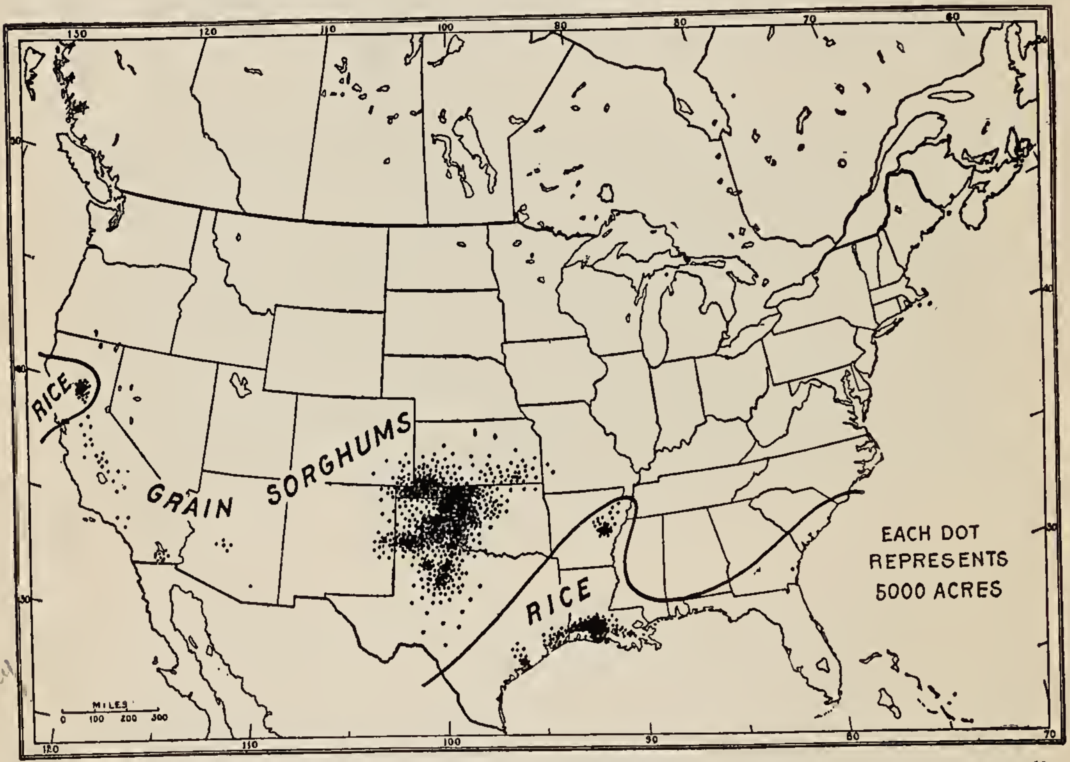

FIG. 19.—The grain sorghums are adapted to relatively dry regions while rice is usually grown on level irrigated flood-plains or delta lands.

Not all regions with proper topography and climate can compete in the rice industry, for suitable soil is also essential. If the subsoil is loose and permeable, the swamp condition can not be maintained except by undue expense for irrigation water, which rapidly seeps away and is lost. Ideal conditions are found where a strong fertile soil is underlain by a stiff clay. Such a combination is most likely to be found on costal plains and river alluvium where changing conditions of deposition have in the past put down in alternating layers clays, silts, and other types of material. Figure 19 shows the regions of the United States now producing rice. The coastal plain of the Carolinas was formerly most important in rice growing, but has declined under the competition of the more extensive methods of the West.

American foreign trade in rice is small compared with that of Oriental countries. The American public does not consume rice in large quantities and even the relatively small crop is sufficient to provide an exportable surplus. As production has increased, exports also have increased and now amount to nearly half the total crop. There continues a small importation of rice into the United States, mainly from Japan.

CORN (Maize)

Corn Distinctively an American Crop.—Corn was found under cultivation in South, Central, and North America by the European discoverers. In North America it existed in remarkable variety of forms and colors among the Indian tribes from Florida to Arizona on the south, and from Maine to Montana on the north. It was introduced into Europe as "maize," the name by which it was known among the natives of the West Indies. In North America it was called "Indian corn," "corn" being the English term for grain of any sort.

Corn played an important part in the early settlement of North America. In a new and forested country, cleared fields suitable for the cultivation of old world grains were developed slowly. From the Indians the colonists learned to kill the trees by girdling, and they were able to obtain a crop of corn without further preparation of the land. With the continued development of American agriculture, corn has declined in relative importance as a direct source of human food. As a field crop it has, however, maintained first rank in quantity of grain produced and in the total value of its products. North America grows more than 60 per cent of all the corn of the world, most of it in the United States.

Corn Climate.—Corn is a warm climate crop. Details regarding its origin and relationships are not known, and although it also is a grass, it belongs to a different species from the small grains. The corn plant is very sensitive to frost and can not, like oats, be planted as soon as the snow has disappeared in the spring, but must make its growth and reach maturity between the last frost in the spring and the first frost of the autumn. Some dwarf and flint varieties of corn come to maturity in 80 to 90 days, and these are cultivated as far north as New England and southern Canada. There larger varieties may be grown for their forage and for ensilage, but without assurance that the grain will mature. Toward the south, varieties of corn are grown which require increasing lengths of time for maturity with decreasing latitude. In the Gulf Coast states 160 to 180 days are necessary. The ideal corn region must not only be free from frost during the growing season, but it must be bright and warm, warm both day and night. In this respect the slow-maturing southern varieties are more exacting than the flint varieties.

Not only must the ideal corn climate be warm, but it must be relatively moist. The best corn lands have an average annual precipitation of 25 to 50 inches, of which at least 10 to 12 inches fall during the growing period of the three summer months (Fig. 7). This distinctly subtropical type of summer climate is found in only a few localities in the intermediate zones. West coast climates in the higher latitudes, such as those of England or of the state of Washington, have not sufficiently high temperatures. Those with higher temperatures, such as Spain and California, have not, in most places, sufficient moisture.

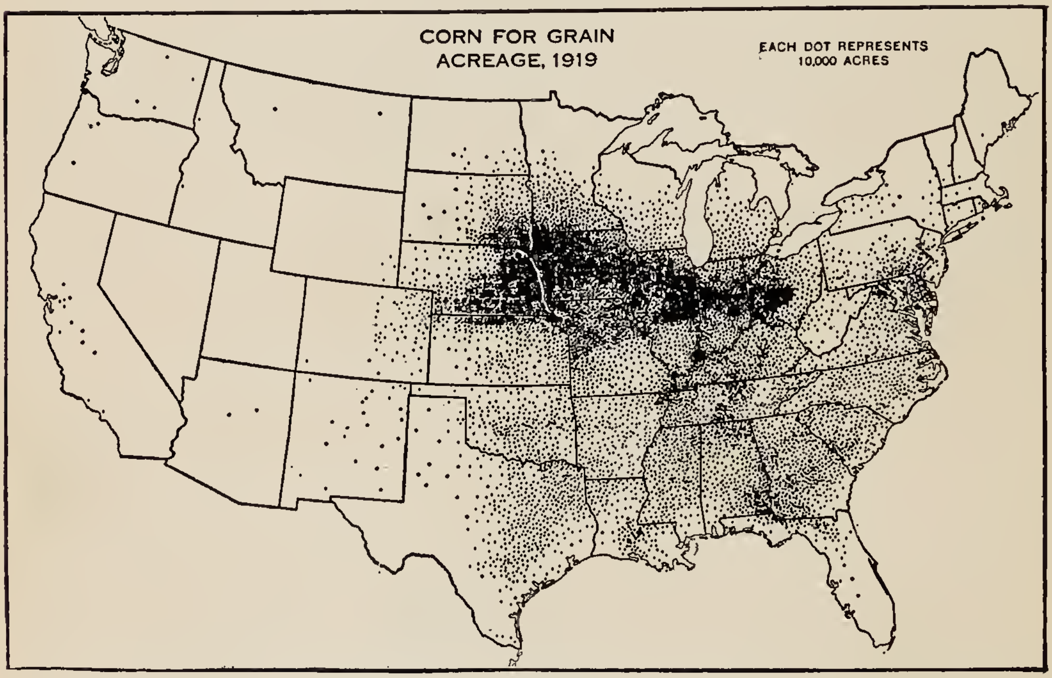

Fig. 20.—The corn belt is a distinct region although a great deal of corn is grown elsewhere. (*U. S. Dept. Agr.*)

The American corn belt (Fig. 20) is the most extensive region of the world having climatic conditions suited to corn. Though the winters are severely cold, the opposite extreme of summer brings truly tropical weather with rainfall of the thunder-shower type, and plenty of sunshine. In addition, the cultivation of corn in this region is favored by a gently undulating land surface and a widespread occurrence of fertile, dark-colored soils retentive of moisture and with high humus content. Under such geographic conditions corn is a much more abundantly productive crop than wheat. The yield of grain per acre averages twice that of wheat, and the forage is worth at least half as much as the grain. Although it costs more per acre to produce corn than wheat, and although the farm value of wheat is more per bushel, larger gross returns enable corn to crowd out other cereals which compete with it for the use of the most suitable land and for the time of the farmer. Thus, there appears in

North America a region in which corn is predominant. It includes the territory extending east and west between northeastern Nebraska and southern Ohio. Six states included in this belt produce nearly half of the American corn crop. In this region also is the largest area of highly valuable farm land in North America. It has a greater total value of farm property than any equal area of the continent and probably of the world (Fig 21). The corn belt is bordered on the north and east by regions in which lower summer temperatures and shorter growing seasons enable the small grains and the grasses to compete more and more successfully with corn and finally to replace it altogether. On the west, decreasing summer rainfall permits wheat to compete with corn up to the line of 8 inches of summer rainfall. West of this line, corn is a minor crop. Even on the irrigated lands of the West, corn is not important. The hot dry winds of the arid lands interfere with the formation of the delicate corn silks and pollen grains, the cool nights interfere with the proper development of the stalk, and the yields obtained are generally too low to be profitable. In the humid South, corn is widely grown and of great importance. It is forced, however, to compete with cotton for space and assumes a secondary place in agriculture, although it outranks cotton in acreage in several southern states.

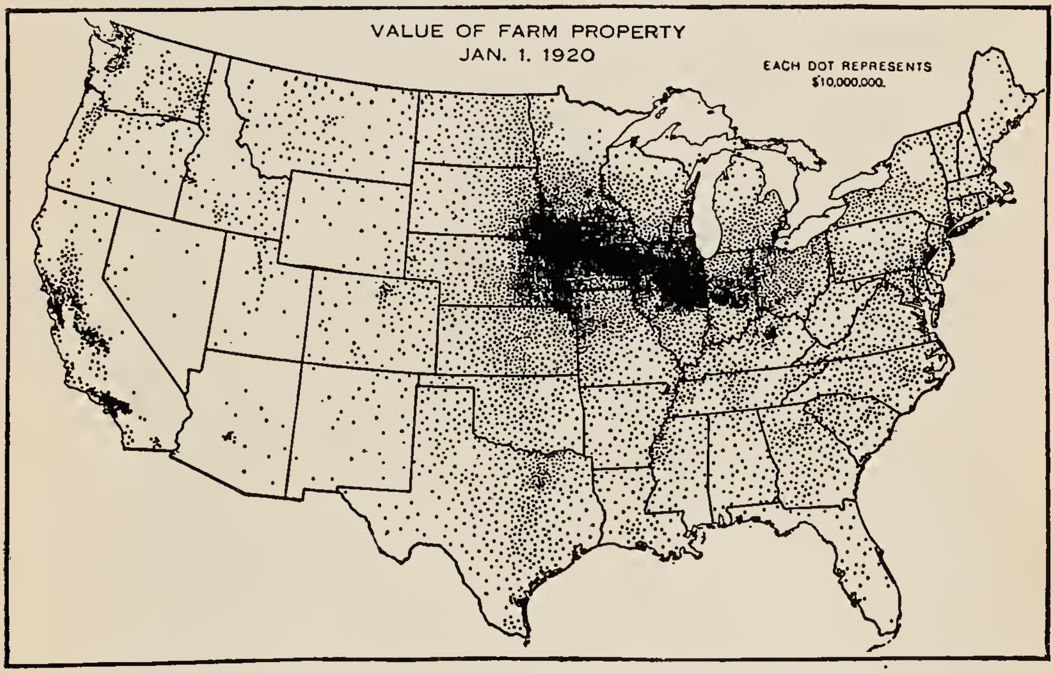

FIG. 21.—The high value of farm property in the corn belt indicates the vast economic importance of that region. (*U. S. Dept. Agr.*)

Economic Factors in Corn Production.—In the early days of corn production, as in the case of wheat, the labor involved was almost entirely manual. The invention of one machine after another has eliminated

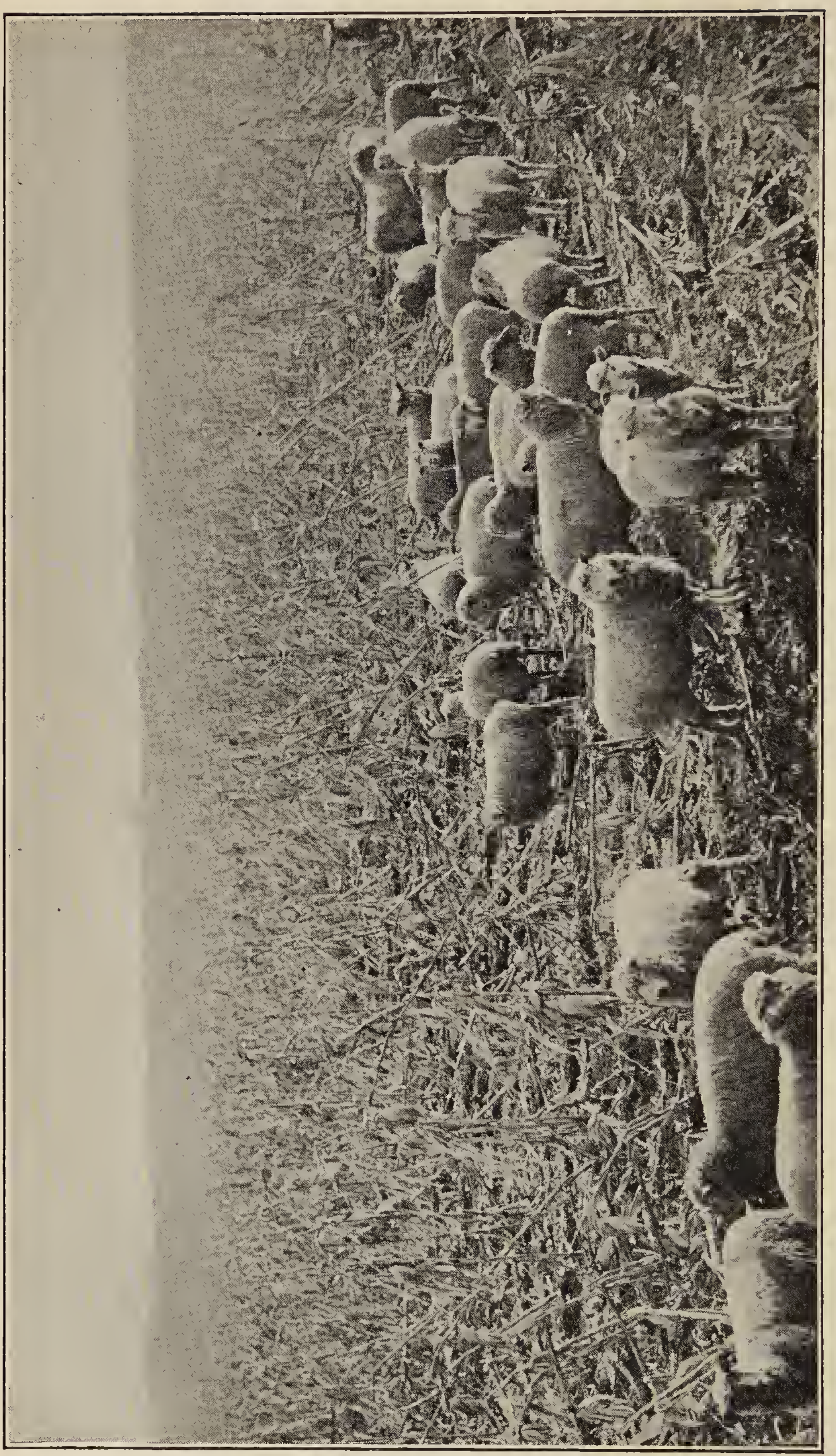

FIG. 22.—A corn field in Iowa. Hogs and cattle are used even more than sheep to harvest part of the corn crop with little human labor. (*U. S. Dept. Agr.*)

hand labor in practically every operation concerned. A large part of the total crop is not harvested but is consumed in the fields by hogs, cattle and sheep, still further reducing the labor costs. Parts of the corn belt, while never densely populated, have suffered an actual decrease in rural population, for the level topography of the region makes the extensive use of machinery possible. In the valleys of the rough Allegheny and Cumberland plateaus, where corn is the principal field crop, it is not possible to use large machines and corn is still tilled with the hoe. In this relatively infertile region which has already a much more dense rural population than Iowa, the number of people has increased.

The coming of the European corn borer, which is rapidly approaching the corn belt after having spread over New England and the Eastern Great Lakes region, is likely to enforce great changes in methods of corn production and harvesting in the next decade or two.

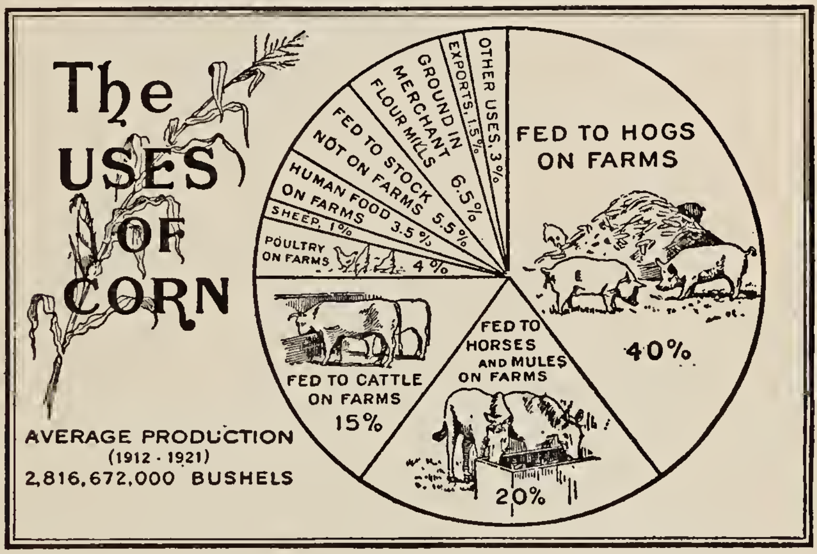

Fig. 23.—More than three-fourths of the American corn crop is used to feed farm animals (*U. S. Dept. Agr.*)

The Uses of Corn.—Although corn is little used in America for direct human consumption, it is, nevertheless, a most important source of human food (Fig 23). The protein content of corn is about two-thirds that of wheat, but it is of a type (zein) that does not become sticky when wet. Corn meal and corn flour do not, therefore, produce light breads but are consumed in various other forms, most largely by the negro population of the South. By far the most important use of corn is as feed for animals. So large a proportion of the crop is thus used that less than a quater of it is sold from the county in which it is produced. The low protein content of the grain is counterbalanced by a very high starch and oil content. Corn is, therefore, an efficient fat-producing feed and the corn belt is the greatest hog and cattle finishing ground in

North America. The corn moves to market in the concentrated form of pork and beef. A pound of pork represents the consumption of at least 5 pounds of corn, and a pound of beef represents 7 or more pounds of corn. In this concentrated form the corn, which on the western margin of the corn belt sometimes reaches the low price of 30 to 40 cents per bushel can pay its transportation to market. The corn fodder, consisting of the stalks, leaves, and husks of the corn plant, also constitutes a valuable animal feed. In many regions a large part of the crop is chopped fine just as it comes to maturity and is preserved in silos. This furnishes a succulent feed during the winter and is especially valuable for dairy cows.

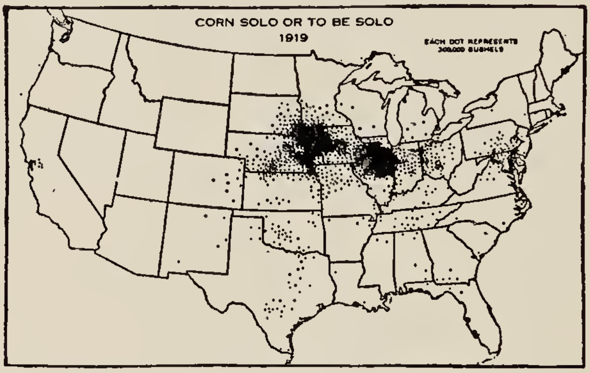

Fig. 24.—Two important regions in which a part of the corn is sold from the farm. (*U. S. Dept. Agr.*)

The silo has considerably extended the northward range of corn, for, in case of early autumn frost the crop can be quickly placed in the silo before the value of the fodder is lost.

In Illinois and parts of Iowa considerable quantities of corn are sold from the farm and find their way into industrial uses (Fig. 24). The industries which use corn as a raw material center around the great corn market, Chicago. In these factories the corn is treated to remove the germ, from which corn oil is extracted, and the starchy portion of the corn is made into a variety of products which includes corn meal, starch, glucose, dextrin, alcohol, and numerous by-products.

In addition to the many varieties of field corn, there is in North America an important production of popcorn and sweet corn. The latter may be thought of as a vegetable and included under the head of truck farming.

Commerce in American corn is very limited. (1) The dent types of corn most cultivated have a high water content and if closely confined in storage or shipped long distances they are subject to damage by fungi and fermentation. (2) The relatively low price makes difficult the payment of the freight charges for long hauls. (3) The foreign demand for corn has in the past been small. Normal exports are less than 1 per cent of the crop.

Important Relatives of Corn.—In parts of the United States are grown three main types of sorghums which yield (1) an edible molasses, (2) a valuable brush used in the manufacture of brooms, and (3) a grain used as feed. These crops have much the same geographic requirements as corn except that in general they are more drought-resistant, or mature in a shorter season so that they escape the disastrous effects of drought. This is particularly true of the grain sorghums which, due to their extensive root systems, their economical use of water, and the character of their flowers, are less harmed than corn by hot winds and low rainfall. This crop is finding an important place in the agriculture of the High Plains states beyond the moisture boundary of important corn cultivation and in the hot interior valleys of the Pacific Slope (Fig. 19). These grains have been introduced from the semi-arid lands of Africa and China where they are eaten by native peoples.

Hay and Forage Crops

The Distribution of Hay and Forage Crops.—Many crops, including grasses, legumes, and cereal grains, are (1) cut and dried for hay, (2) cut and fed green as soiling crops, (3) cut and put up as silage, or (4) used for pasture. The most important in the United States are timothy, clovers, native wild prairie grasses, and alfalfa. Among these there is wide variation in adaptability to different climatic and soil conditions. It will be seen from Figure 25 that nearly all parts of the country are provided with crops which serve some one or more of these purposes.

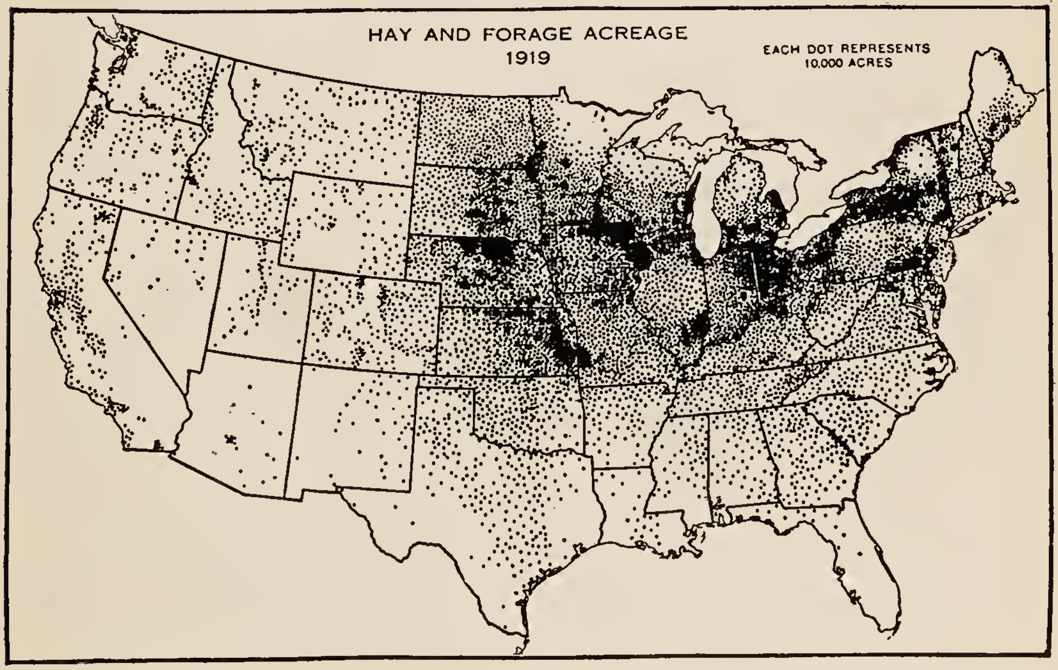

Fig. 25.—Hay and forage crops are widely distributed. (*U. S. Dept. Agr.*)

The combined acreage of all hay crops is greater than that of the corn crop or of any other crop grown in the United States. It is equally clear that the northeastern one-third of the country is the important region for the production of hay and forage.

Hay Crops in the West.—In the West the small acreage of hay and forage is due to the fact that only limited areas have the necessary water for the abundant production of these crops; yet in most of the West they are the leading agricultural crops. Alfalfa is a most productive hay crop on irrigated land. On dry lands native grasses or small grains are raised for hay, and the hay is converted into animal products which are able to bear the cost of transportation to the eastern markets. In much of the Cordilleran region the climate is so dry that the grasses do not grow tall enough to be cut for hay.

Hay Crops in the South.—Hay is not an important crop in the South for several reasons. (1) The hay grasses of the North do not do well in the cotton belt. Active soil erosion makes it difficult to start the crops and climatic conditions cause them to die out. (2) The cropping system of the South is based upon corn and cotton and neither this system nor the type of labor employed is readily adapted to hay production. (3) The heat and humidity of the summers and the frequent rains make the curing of hay difficult. (4) The small development of the livestock industries has not in the past made a large demand for hay. A change in the last-named conditions is in progress, the production of hay is increasing, and new grasses and legumes are being introduced in the hope of securing hay crops which may be more generally satisfactory under southern conditions.

Hay Crops in the Corn Belt.—Next to corn, hay is the most important crop of the region. The conditions of climate and soil in the corn belt permit the growth of several of the various crops used for hay, although the intense summer heat and short periods of drought sometimes cause serious damage. For economic reasons, however, hay is grown on practically every farm in the region. (1) Hay is needed as a bulk feed, in conjunction with corn and oats in raising and fattening cattle and sheep and in the maintenance of farm horses. It is bulky and must be grown at home. (2) Hay fits well into the crop rotations of the farmer. (3) Hay, especially clover and alfalfa, is important in keeping up the fertility of the soil.

Hay Crops in the North and East.—In the Great Lakes region and New England several factors combine to make hay an important crop. In New York it occupies nearly 60 per cent of the land which is in harvested crops and in Vermont more than 80 per cent. Hay also holds first rank as a crop in all of the eastern provinces of Canada. (1) The cooler summers with fairly well-distributed rainfall and frequent periods of summer sunshine are ideal for the growing and curing of the hay crops, but are rather cool for corn. Heavy winter snows diminish the damage which in other regions results from freezing and thawing and winter soil erosion. (2) This is the region of most recent glaciation and there are areas of marsh land better suited to hay than to grain crops. (3) In the eastern part of the region especially, there is much hilly land that is unsuited to cultivated crops. (4) Large quantities of hay are required for the dairy industry of this region and in the city markets with which the region abounds.

Pasture land is in part identical with hay land, for hay fields are frequently pastured. Large total areas are, however, used for pasture alone. The capacity of pasture land to feed animals (shown in Fig. 5) is clearly a composite expression of the relative advantages and disadvantages of regional conditions of climate, topography, and soil.

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CHAPTER IV

VEGETABLE CROPS

The Importance of Vegetables as Food.—Under the familiar term "vegetables," custom includes a variety of items. Botanically the list includes various plants parts: roots, stems, leaves, fruits, and seeds. The vegetables most cultivated in America are, in the order of their acreage,[1] potatoes, tomatoes, peas, sweet corn, watermelons, cabbage, lettuce, green beans, cantaloupes, cucumbers, asparagus, onions, spinach, carrots and celery. p t p p

Many millions of the world's people subsist almost entirely on a plant diet by combining cereals, legumes, and green vegetables. In some of the newer countries of the world, where meat is abundant, vegetables have occupied a relatively unimportant place in the popular diet, but the garden has always contributed a great deal to the food supply of people in the United States. A commercial vegetable industry, however, is of comparatively recent origin, for its development awaited (1) the invention of efficient methods of transporting perishable goods, (2) the growth of large city populations willing to pay for fresh vegetables at all seasons, and (3) an increase in the cost of meat.

The total food available in a ton of green vegetables is not great in comparison with that in an equal weight of cereals or of meat; for example, more than 60 per cent of the substance of white potatoes is water; of cabbage, 90 per cent is water. Notwithstanding this fact, vegetables are important foodstuffs. The root, leaf, and stem crops usually contain quantities of starch or sugar together with mineral substances. In addition there is a high proportion of indigestible cellulose which serves to give bulk to the diet. Vegetables are also rich in vitamines, which are essential to health. The legumes, particularly dried peas, beans, and peanuts, contain from 20 to 25 per cent of proteins or nitrogenous materials, some of which they obtain from the air through the agency of bacteria on their roots. These seeds furnish substitutes for the more expensive proteins of a meat diet.

Types of Vegetable Farming.—The vegetable crops are so many and so different that it is impossible to state any general conditions of climate and soil which are suitable for them all. We find, rather, that economic conditions assume the place of first importance in determining the location of vegetable growing on a commercial scale, and that conditions of geography are, in most instances, secondary. Note

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[1] In 1927.

Vegetables are raised under three systems of farming: (1) home gardening, (2) market gardening, and (3) truck farming.

The home garden is a form of agriculture so well known as to need little comment, its importance may not, however, be so generally appreciated. It is estimated that 80 per cent of the vegetables eaten by the farmers of the United States are raised at home, and a government survey has shown that vegetables for home use constitute nearly 12 per cent of the value of all food eaten on farms, and had in 1919 a value of nearly $70 per farm. When we add to this the unknown value of the produce from thousands of gardens in villages and cities, we see that the home garden is the most important phase of vegetable growing.

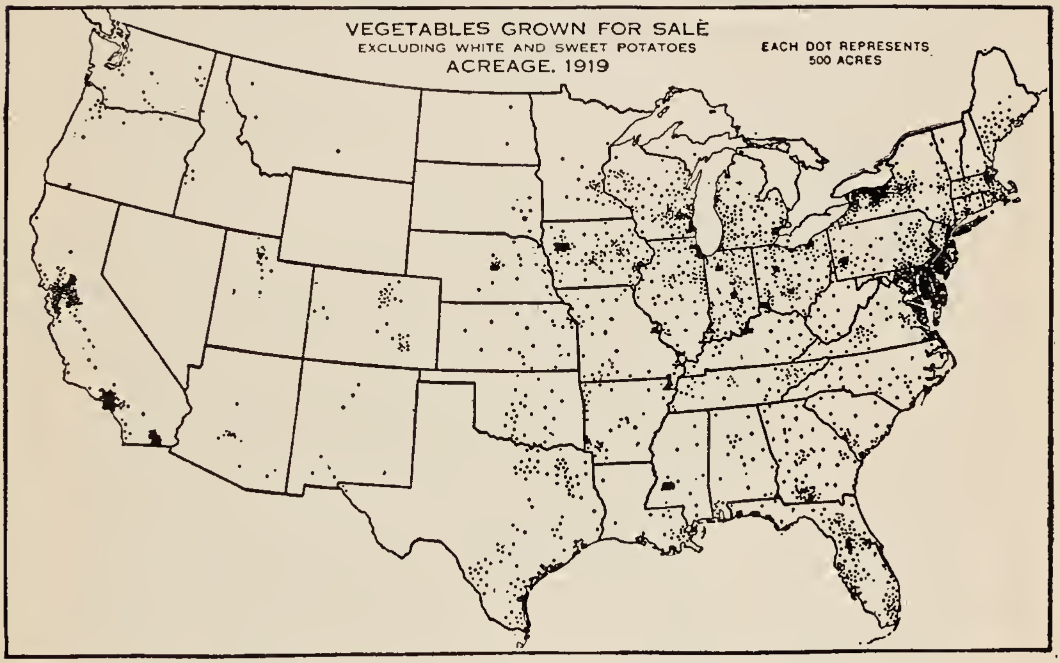
VEGETABLES GROWN FOR SALE
EXCLUDING WHITE AND SWEET POTATOES
ACREAGE. 1919
EACH DOT REPRESENTS 500 ACRES

FIG. 26.—Market gardening and truck-farming centers. (*U. S. Dept. Agr.*)

Market gardening is the growing of vegetables and small fruits for sale. From the preceding paragraph it will be realized that the great market for the sale of vegetables is not generally on the farms, nor in country villages where kitchen gardens supply most of the need. The great market is the city; the larger the city the larger the market. Here are thousands or even millions of people with neither time nor land for gardening. In general, also, city dwellers receive larger cash incomes than the farmers, and hence are able to pay for the service of raising and delivering their vegetables.

Because of the city markets there is a tendency for market gardening to concentrate in the neighborhood of great cities (Fig. 26). This results from the fact that short haul to market enables the gardener (1) to sell his produce fresh from the field, and (2) to reduce transportation and packing charges on a product which is bulky in proportion to its value. Location near the city has also other advantages. Market gardening is an intensive form of agriculture, and, in proportion to the amount of land used, expenditures for labor and fertilizers usually are large. Close to a city, a fluctuating demand for labor by the market gardener is much more easily supplied than it is in rural districts. In the stables and stockyards of a great city quantities of animal manures accumulate. Stable manure is bulky and of relatively low value and cannot stand the cost of shipment to distant farms; it can, however, be used with great advantage by market gardeners located in the outskirts of the city. New York city alone ships annually to gardeners and farmers more than 500,000 tons of stable manure. For these various reasons important centers of market gardening are found in the western end of Long Island, in New Jersey close to New York and Philadelphia, and in the immediate surroundings of Buffalo, Pittsburgh, Cincinnati, Detroit, Chicago, and St. Louis. The smaller cities support market gardens proportionate to their size.

Gardens under Glass.—In the cool temperate climate of northern United States, frost limits the out-of-door production of vegetables and flowers to a season of five or six months. To overcome this climatic handicap nearly 4,000 acres of glass houses are in use in the United States. This is a particularly intensive form of market gardening; one crop follows another in rapid succession on the highly fertilized soil. The industry not only requires the large expenditures for land, labor, and fertilizers characteristic of ordinary market gardening, but large additional expense for the glass houses and for fuel. These large expenses are offset by ability to place fresh flowers and vegetables on the winter market at high prices. Glass-house gardening, like ordinary market gardening, tends to concentrate near the large cities which are its markets. The additional costs of the glass, steel, and fuel have, however, induced this industry to migrate somewhat to the region where these elements are cheapest. We find, therefore, that the cities south of Lake Erie have unusually large areas devoted to this type of horticulture. This is made possible only by fairly large markets and by highly efficient railway service into the still greater market centers both east and west.

Truck Farming and Market Gardening Contrasted.—Truck farming is also the raising of vegetables for sale, and it differs from market gardening only in matters of detail. Truck crops and market gardens in the United States occupy less than 2½ million acres, an area equal only to the corn acreage of North Carolina, from which it differs, however, in that it is much more intensively cultivated, requires vastly more capital and labor, and yields much larger gross returns. Truck-farming regions are often located at considerable distances from their markets, with which, however, they must be connected by efficient transportation.

The development of such truck-farming sections is encouraged by special advantages of climate and soil rather than by closeness to markets. Not infrequently the truck farmer is more of a specialist than the market gardener, and he may confine his efforts to a small number of the common vegetable crops, such, for example, as lettuce or spinach.

American Truck-farming Regions.—The primary consideration in the establishment of a truck farm is transportation to markets. Before the days of improved transportation, nearby market gardens supplied the only fresh vegetables obtainable in city markets. With the advent of improved railway facilities, several regions rose into prominence because of special advantages of climate and soil, and first among these was the Chesapeake Bay region. This part of the Atlantic Coastal Plain, extending from southern New Jersey to Norfolk, Va., is still the great vegetable garden of America. In the early days of the industry shipments were made by oyster boats, and only the nearer markets of Baltimore and Philadelphia were reached. It was not until about 1890 that the development of refrigerator cars and of forced ventilation on boats enabled the trucking industry to expand greatly both in importance and in area.

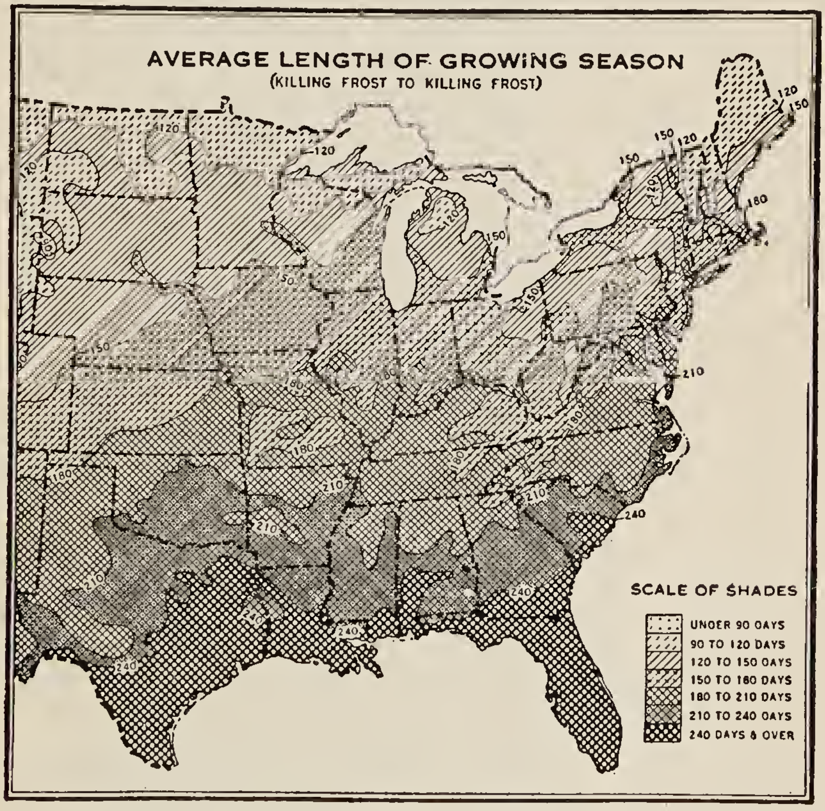
AVERAGE LENGTH OF GROWING SEASON
(KILLING FROST TO KILLING FROST)
120
150
180
210
240
SCALE OF SHADES
UNDER 90 DAYS
90 TO 120 DAYS
120 TO 150 DAYS
150 TO 180 DAYS
180 TO 210 DAYS
210 TO 240 DAYS
240 DAYS & OVER

Fig. 27.—Early springs give the Gulf and Atlantic coasts an advantage in vegetable growing. (*U. S. Dept. Agr.*)

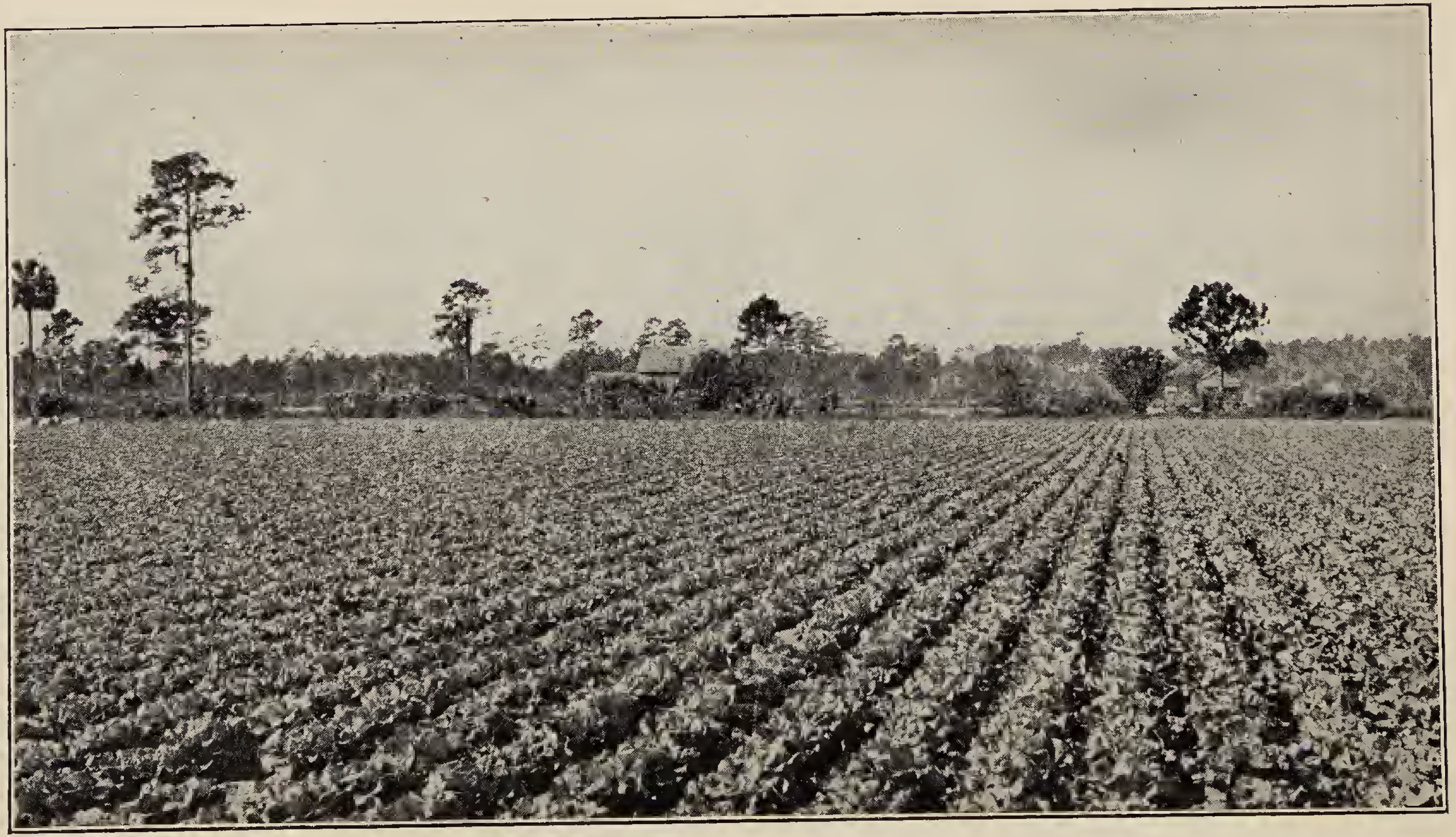

FIG. 28.—A field of lettuce in the truck-farming region of Florida. These intensively tilled clearings constitute but a small fraction of the total land. (*U. S. Dept. Agr.*)

The favorable climate and soil possessed by the Chesapeake Bay region are shared in some degree by much of the Atlantic and Gulf Coastal Plain, whose great climatic advantage is earliness of season. The indented coast of the Chesapeake and Delaware region gives its climate a marine character which serves to stabilize temperatures and to lengthen the growing season. The length of the frostless season at Trenton, N. J., averages 170 days; a little farther south on the shores of Delaware Bay it is from 20 to 30 days longer. At Norfolk, Va., the season is 225 days, the same as at Augusta, Ga., which is 250 miles farther south but not so near the coast. At Wilmington, N. C., the season averages 230 days, at Charleston, S. C., 260 days, and in Florida and parts of the Gulf Coast frost occurs only a very few times during the winter (Fig. 27). Norfolk is the most northerly point at which even such hardy crops as spinach and kale can be grown in the open throughout the winter.

Some of the soils of the Coastal Plain are admirable for vegetable production. The sands and sandy loams of the Norfolk and Coxville series are of the best. These are in general light, warm, well-drained soils capable of being worked very early in the spring, but they are deficient in nitrogen, and for this reason the eastern truck-growing regions purchase large quantities of commercial fertilizers (Fig. 121). The truck soils of the Atlantic Plain are widespread, and only a small part (probably less than 1 per cent) is used for vegetable growing.

Climate and Competition.—In truck farming the early crop secures the best price, and this price may be sufficient to pay both a profit to the producer and the cost of transportation over many hundreds of miles. In North America the regions best suited to very early vegetable production are those with the least frost, such as southern Florida, the central coast of Texas, and southern and central California. In these regions the hardier vegetables may be planted in the autumn and are ready for market in the early winter. Less resistant crops are planted at about the time of coldest weather and are marketed many weeks in advance of the same crops grown in the northern states. On the Atlantic Coast a complete succession of harvest dates is secured, beginning in southern Florida and continuing up the coast to New Jersey. After the season of the New York crop is past, fresh vegetables are shipped south from New England and Canada. Some of these actually go to the city markets of the South. These crops continue to arrive until the approach of cold weather and soon thereafter Florida and California are again ready to continue the almost uninterrupted cycle.

Note

In this competition, cost of transportation is so large a factor that crops from regions nearer the great markets replace those from the more distant regions as soon as the former are ready for market. It follows that any delay in marketing from the distant areas may render the crop unsalable. The business is a hazardous one at best. Competition by growers who raise vegetables under glass near the market is not restrictive because of the greater cost of this type of business. The southern truck farmer has vastly cheaper land and also cheaper labor.

The Transportation and Marketing of Truck Crops.—A market for truck crops is found in every city in the country, and the system of distribution is well organized. The United States government furnishes a crop and market reporting service which enables truck farmers to watch developments in competing regions. The Texas onion grower may know the amount of northern-grown onions in storage and the rate at which they are being marketed. The grower of hot-house lettuce in New York may watch the effects of a freeze on early lettuce in Florida and control his crop to take advantage of the shortage to come. This sort of information helps to prevent the oversupply of markets and aids in a steadying of prices which is to the benefit of the industry.

Although rail transportation is the main dependence of the southern truck farmers, large supplies of vegetables from the coastal districts also move north by boat. Baltimore, because of its location near the head of Chesapeake Bay, is an important terminus for this traffic. In addition to the wholesale markets of the city, there is a large forwarding trade in vegetables and fruits destined for eastern and northern cities. Cincinnati serves in a similar capacity for the markets of the Middle West. "Lying as it does, . . . at a point convenient to either North, South, East, or West, it is the gateway for all southern produce to . . . such cities as Columbus, Cleveland, Dayton, Akron, Hamilton, Toledo, and Detroit. Even traffic from the South consigned to points west of the Mississippi River passes through the Cincinnati gateway."[1] The ability of the rich eastern market to absorb early truck crops at high prices has induced the vegetable growers of the Bermuda and the Bahama Islands and of the west coast of Mexico to compete with the American growers, and for this traffic special shipping services are maintained.

The Trade in Fresh Vegetables a Large One.—The densely populated East is the greatest of all markets for the American fruits and vegetables. An indication of its capacity is seen in the statement that in one night 650 carloads of fresh fruits and vegetables were unloaded and sold in the city of New York alone.[2] More than 20,000 carloads of fruits and vegetables, exclusive of local truck crops, are handled every year in the markets of Philadelphia. The total volume of the United States' trade in truck crops is indicated by the fact that in 1927 shipments of lettuce exceeded 46,000 cars, of tomatoes 32,000 cars, of watermelons 45,000 cars, and of cantaloupes 36,000 cars. About half of the commercial crop of cantaloupes is now grown under irrigation in the Imperial Valley of California.

[1] *Weather Crops and Markets,* vol. 3, No. 5, p. 81.

[2] Jones, H. H. *Market Grower's Journal,* Nov. 1, 1921, p. 15.

Vegetable Supply Crops.—The competition for the early northern market is the spectacular phase of the trucking industry, yet the total quantity of these early southern vegetables is not so great as that raised nearer the market, that which constitutes the main supply crop. The supply crops tend to migrate to such localties as are easily accessible to market and have, at the same time, some special advantage in quality of soil or in climate. For example, the early crop of onions is raised in Texas and Louisiana, but the later crops of New York, Ohio, Massachusetts, and other eastern states total a much greater amount. Quantities of early cabbage are shipped from Texas, Louisiana and California, but the main crop is raised in New York, Wisconsin, and New Jersey. Florida leads in the growing of green beans as a winter crop, but New York, New Jersey, and Maryland together raise twice as many later in the season.

Vegetables for Canning and Drying.—Certain vegetables, such as tomatoes, peas and sweet corn, have a relatively short season of growth in the North, and have not attained much importance as early crops shipped from the South. Early tomatoes are shipped from California, Florida, the Bahama Islands, and Mexico, but at a high price. To utilize these short-season vegetables and others a canning industry has developed in many localities, particularly in northeastern United States. The commercial canning of vegetables has several advantages. (1) It greatly increases the quantity of these valuable foods consumed by the average person by making them available throughout the year. (2) It increases the total quantity consumed by making such foods available in regions where they could not possibly be grown. (3) It permits these crops to be grown in climates and soils best suited to them regardless of an immediate market. (4) It also provides a profitable outlet for what would be an unmarketable surplus in years of abundance.

The most important of all vegetable canning regions is that adjacent to Baltimore where tomatoes, sweet corn, peas, and asparagus are grown in large quantities. The canning of peas reaches its greatest importance, however, in Wisconsin and New York, where the cooler weather favors the growth of this hardy crop. Sweet corn is most abundant a little farther south, the center of its zone extending from Iowa to New Jersey. Tomatoes occupy a still more southerly latitude, the principal centers of the canning industry being sothwestern Missouri, central Indiana, Maryland, and Virginia.

The canning industry of California includes some vegetables as well as fruits, the most important being asparagus, which thrives in the delta region near San Francisco Bay. California has more than five times as many acres of asparagus as New Jersey, its greatest competitor.

The Potato in America

Potatoes American in Origin but European by Adoption.—The white potato is the most widely grown vegetable in North America. It is raised in Alaska, in every settled province of Canada, and in every state of the United States. Notwithstanding this fact, it may be said that the potato is not ideally suited to the climate of the major part of the continent. The white potato originated in the relatively cool plateau lands of the Andes, where varieties of the plant may still be found. It was introduced into North America and into Europe at about the same time, but has found in Europe a habitat so much more congenial that the total crop of that continent averages more than ten times that of North America. The average yield of potatoes in the United States is about 116 bushels per acre, in Germany 200 bushels. The average American eats about 2.5 bushels of potatoes per year. In Germany the average is more than 7 bushels. Much of the difference in production may be attributed to conditions of climate.

10 x Crop of America

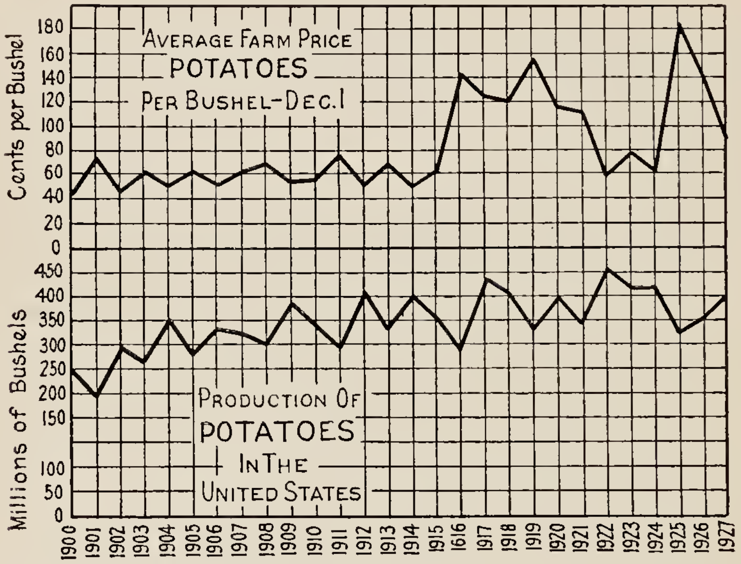

Fig. 29.—A small potato crop in the United States usually brings a high price, which, in turn, usually results in a large crop and a low price the year following.

Climate and Soil for Potato Culture.—Potatoes need cool, moist weather and are frequently injured when forced to mature in the hot and often dry weather of American summers. For this reason, especially in the South, early and late crops are grown, the one maturing before, and the other after, the period of greatest heat. For the same reason. early planting in the corn belt is a distinct advantage. Heat-resistant varieties are known, but they are of indifferent table quality. The moisture requirement of potatoes is high, and rainfall is particularly essential when the tubers are forming. Erratic rainfall of the American continental type may be the cause of large yields one year and of widespread failure the next. The influence of these conditions upon potato prices is shown in Figure 29.

Soils best suited to potato culture are loose in texture, permitting drainage, the development of strong roots, and the expansion of the growing tubers. Potatoes for home use are grown in almost any type of soil.

Centers of American Potato Growing.—The American potato crop has a general distribution somewhat like that of the human population. This is due in part to the bulkiness and usual low value of the potatoes which require that the main crop be raised near its market. The industry may, however, be divided into two types: (1) early potato raising, and (2) the production of the supply crop. Like other early vegetables, early potatoes are raised in the South. In southern Florida, planting begins before Christmas and the crop is ready to harvest by the end of March. The coast zone, from Florida to Texas, is followed in order by one zone after another until the early crop of Virginia, Kentucky, and Missouri merges with that of the northern states about July 1. Most of the early potatoes of the South are raised from vigorous seed shipped from the cooler northern states. Los Angeles and Stockton, Cal., are also early potato-raising districts. The main supply crop, though widely distributed, shows several areas of special concentration (Fig. 30). These

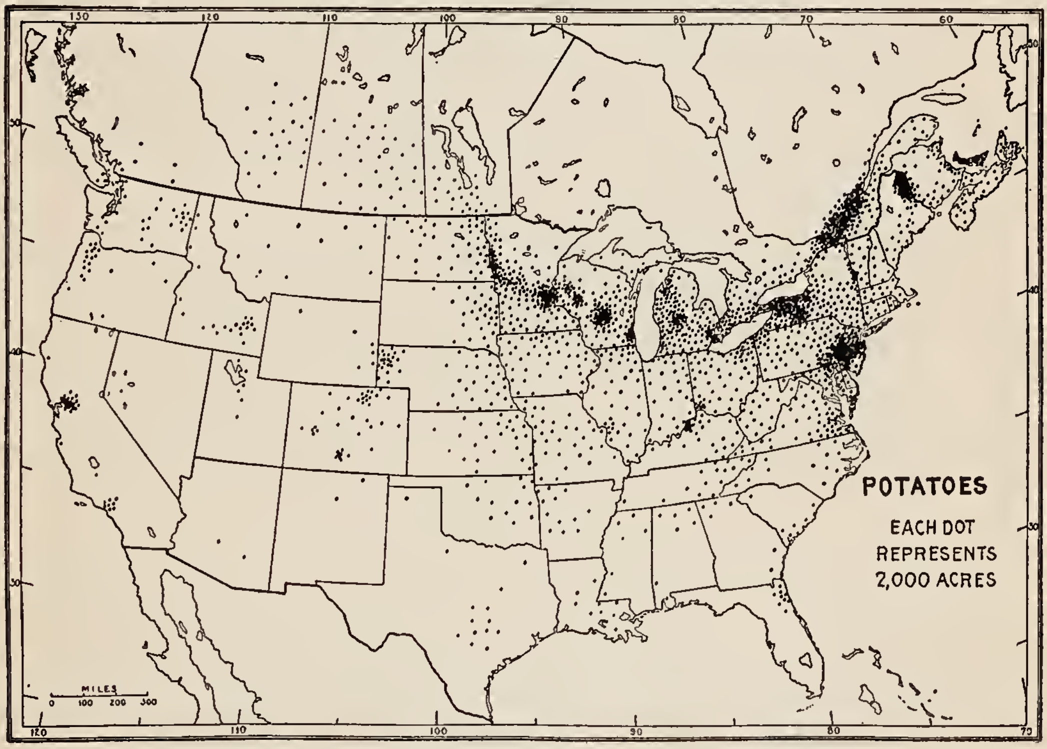

Fig. 30.—The principal potato-growing centers of the United States and Canada.

are (1) Aroostook County, Me.; (2) southeastern Pennsylvania, central and southern New Jersey, and the Chesapeake region; (3) a long and nearly continuous belt extending from Quebec through central New York, Ontario, and northern Ohio, lower Michigan, central Wisconsin, and Minnesota into the valley of the Red River of the North; (4) the irrigated districts of the West, among which there are especially to be noted Greeley, Col.; Pocatello, Idaho; and the Yakima Valley, Wash. It will be observed that all these regions are on or beyond the margin of the corn belt. Several of the districts also are in regions of light, sandy, or sandy-loam soils. These soils are found particularly in Maine, New Jersey, western Michigan, central Wisconsin, and eastern Minnesota. Of all these regions northeastern Maine has the most favorable conditions, the most intensive industry, and the highest yields. About 265 bushels per acre is the average yield in Maine, while under the higher average summer temperature and in the heavier soils of Illinois the average is about 85 bushels per acre. Aroostook County ships annually more than 25,000 carloads of potatoes. In only a few other counties of the commercial potato regions do shipments exceed 5,000 cars and in most of them it is less than 1,000 cars per county.

The principal crop of potatoes does not move far to its market. Maine, New York, and the New Jersey region supply the large eastern centers of population. Michigan, Wisconsin, and Minnesota potatoes move southward, the bulk of the Wisconsin crop being sold in Wisconsin and Illinois, and of the Michigan crop in Michigan, Ohio, and Indiana. Several of the important potato-growing districts are close to large cities.

The Sweet Potato

Sweet potatoes are not tubers but are the fleshy roots of a tropical plant. Unlike white potatoes, they thrive in the heat and humidity of the long southern summers. They are commonly grown throughout the South, and as far north as New Jersey and Iowa, but Georgia and the Gulf Coast states are the leading producers.

Beans

The dry edible bean crop of North America is about 17,000,000 bushels per year. This is less than that of Italy alone. Yet the crop is an important one because of its high protein content and its use as a meat substitute. A much greater use of beans in the American diet is not likely so long as meat remains so abundant that the average consumer can afford it.

Beans are, in general, adapted to mild, moderately moist climates, and are troubled by insect and fungus pests in warm, humid regions. Some varieties, such as the white beans most common in America, mature in a short season and can be grown north of the corn belt, avoiding heat and humidity. The principal bean-growing regions include (1) central Michigan, southern Ontario and Quebec, and western New York and (2) California (Fig. 31.)

Lima beans are of tropical origin and require a long season with uniform temperature and moderate rainfall. Practically the entire American commercial crop is raised on the seaward slope of southern California.

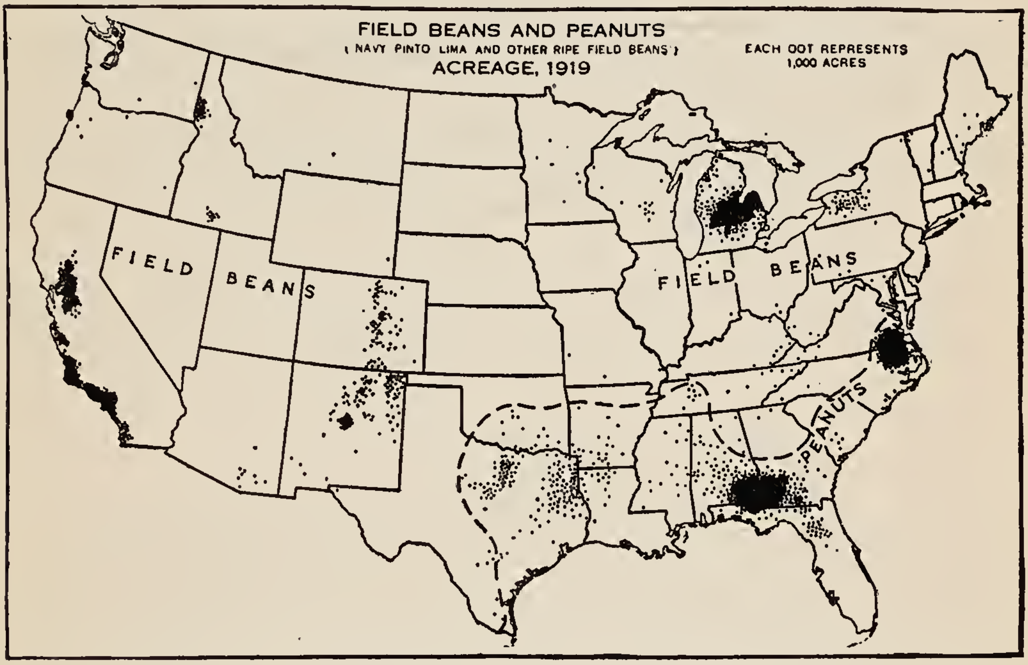
FIELD BEANS AND PEANUTS
(NAVY PINTO LIMA AND OTHER RIPE FIELD BEANS)
ACREAGE, 1919
EACH DOT REPRESENTS 1,000 ACRES
FIELD BEANS
FIELD BEANS
PEANUTS

FIG. 31.—The regions of the United States which specialize in beans and peanuts. (*U. S. Dept. Agr.*)

PEANUTS

No other edible legume has come so rapidly into importance in recent years as has the peanut. This is largely due to its value as a source of oil, which is discussed elsewhere (page 85), yet the peanut is much more used as human food than formerly when it was sold only by the venders of pop corn or at fruit stands. In addition to their valuable oil the seeds contain 24 per cent of protein, and in the form of peanut butter and of confections are becoming a common food. The cakes from the oil mills are important stock feed; so also are the vines when made into hay. The whole plant is sometimes eaten by swine which are turned into the field to fatten.

The peanut is of tropical origin and in America its production is confined almost entirely to the Atlantic and Gulf coastal plains where the light soils and long summers of the trucking regions furnish suitable conditions for the development of the underground pods. In 1899 the crop raised in the United States was 12 million bushels; 20 years later it had increased to about 35 million bushels with a value of about 32 million dollars. In addition, the United States now imports a large quantity of peanuts, mainly from Asia.

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CHAPTER V

FRUIT CROPS

Geographic Background of Fruit Culture.—Fruit culture, like vegetable raising, is a complicated industry, involving a wide variety of products which require unlike conditions of natural environment. The success of any phase of the fruit industry depends even more upon biologic and economic conditions than upon those of a geographic nature. These matters are of primary concern to the horticulturist. The student of geography, however, can find many interesting relations to topography, climate, soil, and geographic position with respect to markets, in the distribution of the fruit-producing regions, their peculiar characteristics, and the ways in which their crops are marketed.

Apples

America's Most Important Fruit.—The apple crop of North America is larger, more valuable, and occupies a greater area than all other fruits combined, yet compared with the staple crops its place in American agriculture is relatively small. The average apple crop of the United States and Canada is about 200 million bushels of which only about 112 million bushels may be called the "commercial" crop. Nearly half of all the apples—the produce of scattered and often poorly tended orchards—are consumed on the farms on which they are grown and in the nearby villages, or are turned into by-products, or go to waste. On the contrary, the commercial crop is grown mainly in scientifically-managed orchards, most of which are included in the several great orchard regions shown in Figure 32. This specialized form of apple raising has increased greatly in recent years at the expense of the old-time farm orchard, which is no longer a very large factor in the commercial apple industry.

Favorable climatic and soil conditions for apple growing are so widespread in North America that the area of suitable land is vastly greater than is needed to supply all of the apples required. Commercial apple growing has therefore prospered in districts which are in some way specially favored, or for which special markets have been created by human enterprise. Among the numerous varieties of apples there are various degrees of hardiness; in general, however, the northern limit of the apple belt is determined by an average winter temperature of 13°F.

This boundary includes most of the Maritime Provinces of Canada, and most of Maine. From there the northern boundary crosses Quebec and Ontario to Sault Ste. Marie and continues westward through Wisconsin and Minnesota. On the west the apple belt does not extend much beyond the line of 18 inches of annual rainfall. While the failure of apples beyond this line is due mainly to lack of rainfall, it is also due to frequent cold, dry winds in winter, unseasonable frosts, and frequent hail storms. In the Cordilleran region of the West most of the apples are raised under irrigation. The southern margin of the apple belt is determined by summer heat and humidity and roughly concides with the average summer temperature line of 79°F.

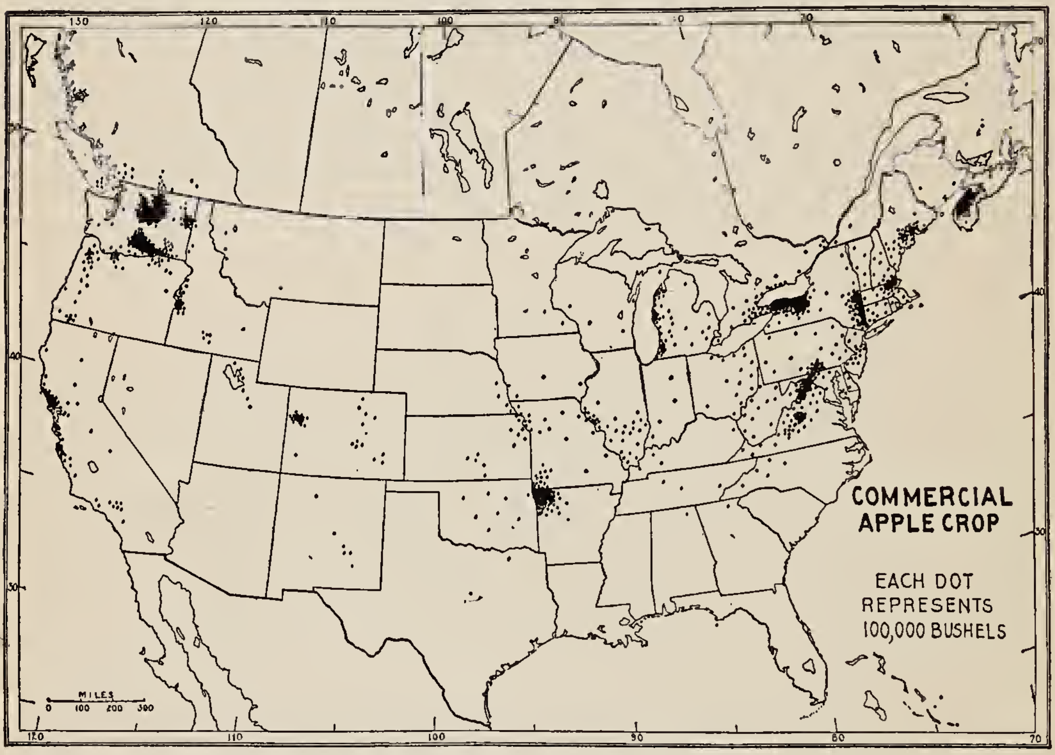

Fig. 32.—The commercial apple crop of the United States and Canada is restricted to rather well-defined regions. The non-commercial crop is much more uniformly distributed.

Apples are successfully grown on a variety of soils. They require only moderately porous soils of free underdrainage.

The Northeastern Apple Districts.—In the Maritime Provinces of Canada and in New England are four or five apple-growing regions of which the more important are the Annapolis-Cornwallis Valley of Nova Scotia, the New England Baldwin belt, which extends from Maine to Connecticut, and the Hudson River Valley. This northeastern region normally supplies about 15 per cent of the commercial crop of the continent. Unlike the newer commercial orchards of the West, these are mainly small orchards of old trees in which new planting barely keeps pace with loss.

The famous orchards of the Annapolis Valley occupy a particularly favored spot. The peninsular character of the Province affords the protection of a marine climate. The valley is broad and open, about 80 miles long and 4 to 12 miles in width. The orchards lie on the well-drained slopes of the valley, protected by a low mountain range from the continental winds, which may sweep across the Bay of Fundy. (Since the valley usually markets a large part of its apples in England, its location, while somewhat isolated from the rest of North America, brings it, in fact, nearer its market.) Not The New England orchards occupy, in part, rough lands and relatively poor granitic soils and are not so productive or so profitable as some of the larger and better situated orchards of the West. The predominance of Baldwin apples in this region gives the name to the largest district. The crop is marketed principally in New England and New York.

The orchards of the Appalachians extend from Pennsylvania to northeastern Georgia. This belt includes several adjacent districts, such as (1) the Shenandoah-Cumberland valley region, and (2) the Piedmont region, which extends along the eastern front of the Blue Ridge of Virginia and more or less continuously through the Carolinas into Georgia. While there are many old orchards in the Appalachian region, others are newer and more productive than those of New England. In addition to the hardy varieties of the North, these southern orchards grow some varieties less resistant to cold. The region, as a whole, produces about 15 per cent of the normal commercial crop of North America, nearly one-half of it in the Shenandoah-Cumberland section.

Orchards Near the Great Lakes.—The Great Lakes serve as regulators of temperature and moisture on their [illegible] leeward shores. In the spring the cold of the lake retards the blooming of the fruit until the season is sufficiently advanced so that disastrous frost is not likely to occur, while in the autumn the heat radiated from the lakes delays the occurence of frost. In the winter the lake influence moderates both the temperature and the dryness of the westerly winds. These conditions permit fruit to be grown in a latitude which is unsuitable farther west. Several centers of commercial apple culture have been established in this region of which the more important are (1) western New York, (2) the Niagara Peninsula of Ontario and the north shore of Lake Ontario, and (3) the fruit belt of western Michigan.

Until recently, western New York was the most important American apple region. The commercial orchards of this district are mainly on the glacial lake plain and border the lake in a belt about 10 miles wide for a distance of 150 miles eastward from Niagara Falls. The apple industry of this section of New York is interesting on account of its early start, the present great age of some of the orchards, and the fact that it has always been conducted as an adjunct to general farming. Few farms in this belt have more than 10 per cent of their areas in apples, yet about 10 per cent of the commercial apples of the United States are raised in western New York. This region is geographically continuous with that of Ontario. From the New York and Ontario districts apples are shipped both east, and west, and some Ontario apples compete with the Nova Scotia product in the English market. The apple industry of the Michigan fruit belt resembles that of New York in many geographic respects. The markets of this district lie mainly to the west, including Chicago and Wisconsin. The commercial crops of the several Great Lakes regions combined average about 18 per cent of the total for North America.

The Central Plains apple region consists of isolated districts in southern and western Illinois, in the Ozark Mountains, and in the Missouri and Arkansas River valleys. These areas lie far enough south in the Central Plains, so that, although damage from severe winters and unseasonable springs is frequent, it does not occur every year. During the season of 1921-1922, for example, only 8 carloads of apples were shipped by Missouri growers. Cold weather during the budding period was the cause of the damage. In the 1922-1923 season more than 2,000 carloads were shipped. The combined apple crops of all the commercial orchards of the Central Plains region average only about 7 per cent of the total for North America.

Irrigated orchards are located in various parts of the West from the Pecos Valley in New Mexico to the Okanogan Valley of British Columbia. This vast territory includes more than a dozen orchard regions among which the best known are the Grand Valley of Colorado; the Wenatchee and Yakima valleys of Washington; Watsonville, Cal.; and the Hood River Valley of Oregon. In general, these regions have dry, sunny climates and require irrigation, though in the districts nearest the Pacific Coast, irrigation is not universally practiced (Fig. 33).

In the irrigated orchards of the West, apple culture is of a highly specialized character. As compared with the less intensively cultivated orchards of the East they have many disadvantages; (1) the land is high in price; (2) there is constant heavy expense for irrigation; and (3) their principal market is hundreds or even thousands of miles distant. Offsetting these difficulties are several important advantages: (1) in some of the regions frost damage is not common; (2) fungus diseases are more easily controlled than in the East; (3) control of the water supply induces heavy yields; and (4) the high proportion of sunny weather produces a highly colored fruit of dessert character. These apples are carefully graded, wrapped, and packed in boxes, rather than shipped in barrels or

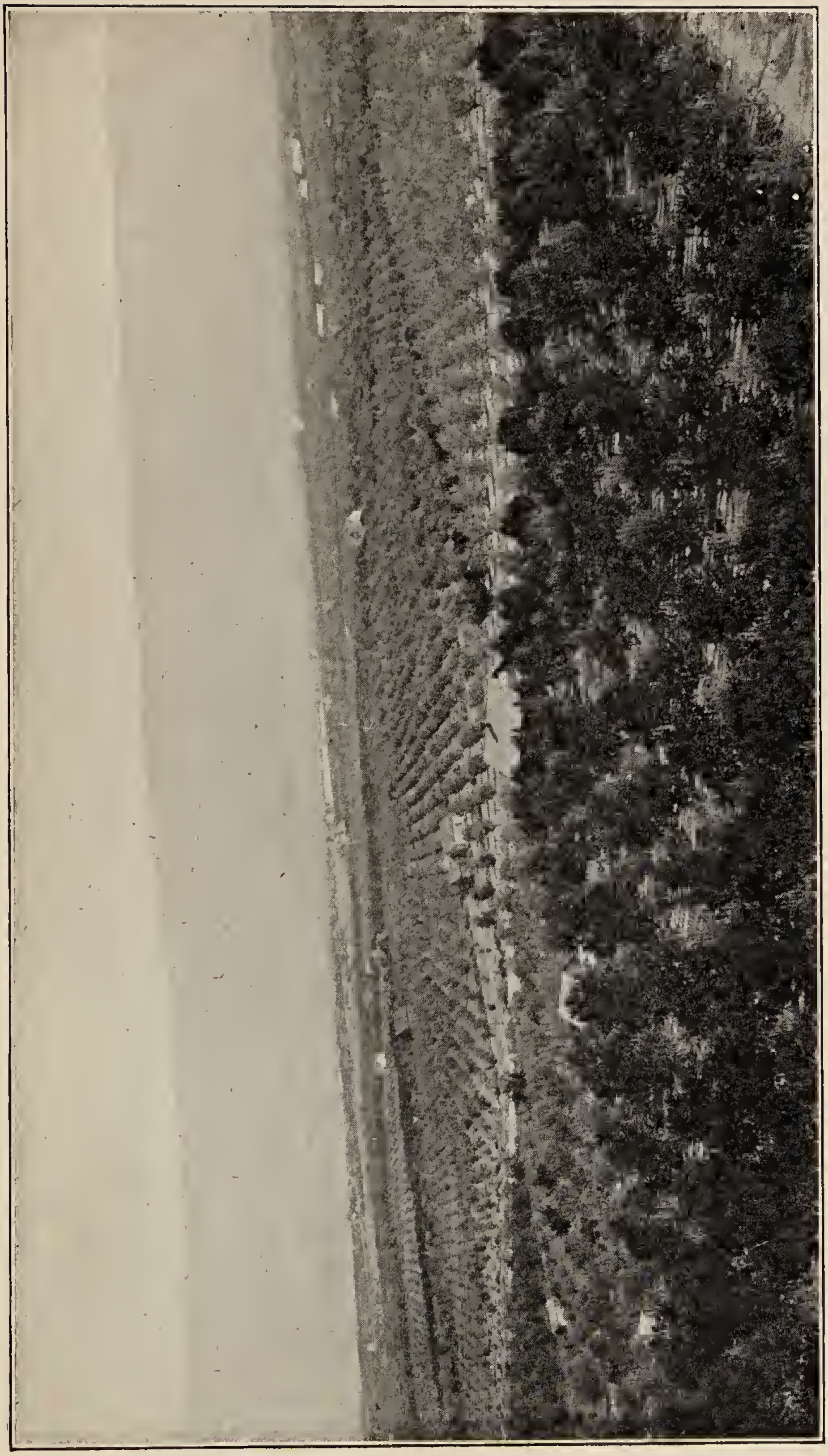

Fig. 33.—An irrigated apple orchard in the Wenatchee Valley, Wash. The close spacing of the homes and the intensive cultivation of this valley indicate small holdings of expensive land. (*U. S. Dept. Agr.*)

in bulk. They are marketed by cooperative organizations and usually command prices which justify the large expenditures.

The combined crop of the orchards of the Cordilleran section of the continent averages about 41 per cent (in 1921 over 65 per cent) of the commercial apples of North America. Nearly one-half of the western apples are shipped from the Wenatchee and Yakima valleys of Washington. Only a small part of this fruit can be consumed in the sparsely populated West. Apples from British Columbia move eastward to compete with those of Ontario in the markets of the Central Provinces. In the same way, the fruit of Washington or of Colorado competes in the East with that of the eastern orchards. From the Pacific ports of both Canada and the United States apples are shipped across the Pacific and through the Panama Canal to many markets. The total export of apples from the United States is relatively small—about 5 per cent of the commercial crop—but nearly one-half of the Canadian crop is exported. The largest foreign market for the apples of both Canada and the United States is Great Britain.

Pears

Geographic Influences in Pear Growing.—The growing of pears is much less important in North America than is the growing of apples. The total average crop of about 20 million bushels is only one-tenth as great as the apple crop. This is to be attributed in large part to the poorer shipping quality and keeping quality of pears. Most varieties of pears must be consumed quickly after they ripen, or must be preserved by canning. The pear tree is somewhat less hardy than the apple and its range is somewhat farther south.

Westward Migration of Pear Growing.—The raising of pears as a commercial enterprise is rapidly migrating to the Pacific Coast. Half of the entire pear crop and three-fourths of the commercial crop of the United States now grows in the three Pacific Coast states, mainly in the Sacramento, Rogue River, and Yakima valleys (Fig. 37). The rapid migration of this industry has been encouraged by the spread of pear diseases which have very nearly exterminated some of the more prized varieties in the East. Vigorous methods of disease control and drier climate in the West, have retained such pears as the Bartlett which now hold the eastern market for dessert pears. The West also has the advantage of ample fruit-canning facilities which provide an outlet for the unmarketable surplus of abundant crop years.

Peaches and Apricots

Climate and Soil Influences in Peach Culture.—The distribution of peach growing in North America shows a general response to climatic influences very similar to that already described for pears. In districts such as the Central Plains, where winter temperatures frequently fall to −15°F., the peach buds are likely to freeze, and the risk of crop failure under such conditions is so great as to discourage commercial peach culture. The influence of bodies of water in controlling temperatures has been described; it is not surprising, therefore, to find that the most northerly peach districts in North America are on the Pacific Coast and in the fruit belts of the Great Lakes region in Michigan, Ontario, and New York. This crop is almost entirely absent from the Central Plains north of central Iowa (Fig. 34). The earlier blooming habit and tender foliage of peaches, as compared with apples, makes security from late spring and early autumn frosts even more important. For this reason, rolling topography, where peach orchards may occupy intermediate slopes, permits the drainage of cold air to lower levels, where frost may occur while the orchard sites remain unaffected. The susceptibility of peach trees, buds, and blossoms to cold and frost leads to frequent losses in practically all peach regions. For example, in Massachusetts and in the Great Lakes districts not only the buds but the trees have on several occasions been killed by long-continued winter cold, and thousands of acres of orchards destroyed. Notwithstanding their sensitiveness to cold, peaches do not fruit abundantly in regions of continuously warm temperatures.

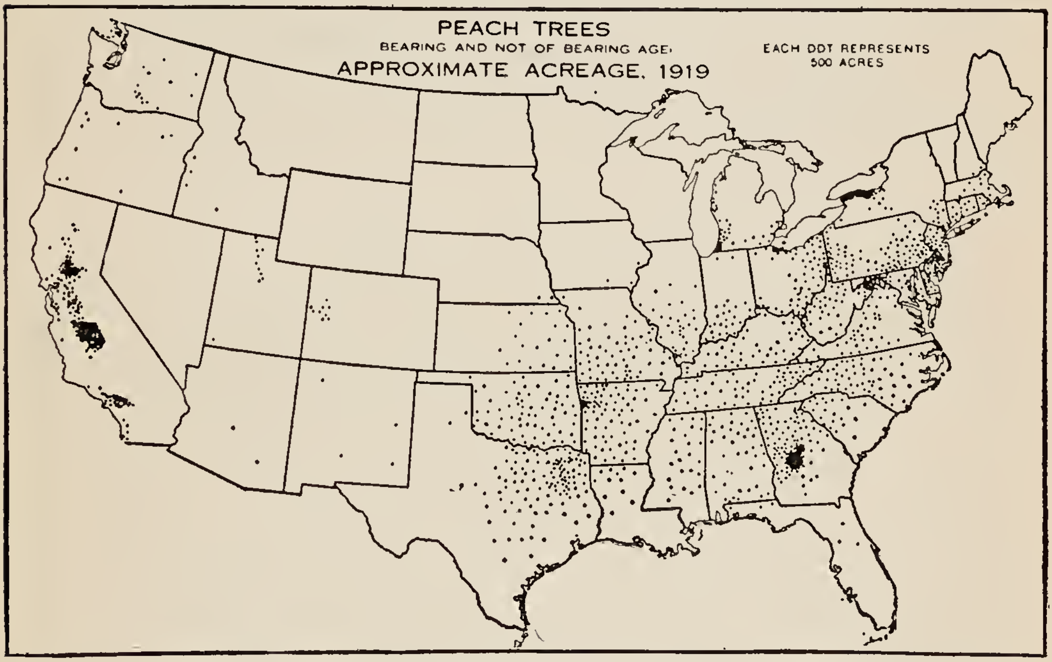
PEACH TREES
BEARING AND NOT OF BEARING AGE.
APPROXIMATE ACREAGE, 1919
EACH DOT REPRESENTS 500 ACRES

Fig. 34.—Peach growing has prospered in regions of mild winters or in protected situations. (*U. S. Dept. Agr.*)

American Peach Regions.—The total American peach crop averages more than 50 million bushels, one-fourth as much as the total apple crop. The commercial crop, which is more than half the total, is grown in more than 30 states and provinces. A few centers of special importance, however, market a large portion of the peaches. In the East the most important areas are in Georgia (noted for its early crop), Texas, Arkansas, and the Great Lakes districts. From the hill slopes of Georgia alone comes 15 per cent of the commercial crop.

Peach growing has also migrated to the favorable climates of the Pacific Coast where fast refrigerator trains take fresh fruit to eastern markets, and where weather for drying and facilities for canning provide for that part of the crop which cannot be profitably sold fresh. The average peach crop of California is nearly 40 per cent of the commercial crop of the continent.

Apricots are closely related to peaches but differ from them in hardiness. So sensitive to cold is this tree that it reaches commercial importance only in California and in certain select localities in Oregon and Washington. The market for fresh fruit is limited and the crop is mainly dried or canned.

CHERRIES, PLUMS, AND PRUNES

Cherries and plums exhibit many of the characteristics of distribution previously noted for the other tree fruits. Both are widely grown in the East, but also show an increasing importance in the great fruit garden of the continent, the Pacific Coast. Of the two fruits, cherries are more restricted in distribution, the eastern sour-cherry belt being practically coincident with the corn belt. Notable extensions are found in the fruit region of New York, western Michigan, and the Door County Peninsula of Wisconsin. Sweet cherries are grown in limited sections of the East but mainly in the Pacific Coast regions.

Plums show a much more general distribution within the northern limit of apple culture and even beyond it into North Dakota. In the East the crop is produced mainly for local markets, for the fruit is easily damaged in transit. The favorable climatic conditions of the Pacific Coast, and freedom from diseases, make possible the growing of large, solid varieties which reach the eastern market through the long season from May to December. The most important plum crop of the West consists, however, of those varieties which are grown in the Pacific Coast states for drying. They are called "prunes," but not all western plums are prunes for only certain varieties have the proper firmness and sweetness. Prune growing has become an important industry in Oregon and California, particularly in Santa Clara County. American-grown prunes are now able to supply the home demand and yield a surplus for export. In 1890 America imported 60,000,000 pounds of prunes from southern Europe, but imports have now ceased and the annual exports have exceeded 175,000,000 pounds.

Note

SMALL FRUITS

The growing of small fruits (mainly berries) is an industry similar in many respects to truck farming, with which it is often allied. The bush fruits are, for the most part, hardy. Some of them have long blossoming seasons and late frosts can destroy only a part of the crop. In general, their fruits do not stand transportation well and are grown for local markets. As a result of these conditions the principal bush-fruit region lies in the area of large population north of the Ohio River and east of the Missouri.

Strawberry growing resembles, in some respects, the potato industry, there being an early crop from the South, followed by crops from a succession of regions ending with a main supply of crop in the North. The centers of intensive strawberry culture are so distributed that part of them coincide with centers of fruit growing and part of them with well-known truck-farming districts. Among the former are the Niagara Peninsula of Ontario, western Michigan, the Ozark Mountains, and the San Francisco and Los Angeles regions. Among the trucking centers which also ship strawberries are Tampa, Fla., New Orleans, La., Norfolk, Va., and the Delaware River region. The industry is influenced by economic conditions much more than by those of natural environment. Compared with the quantity of bush fruits harvested the total North American strawberry crop is large, averaging about 10,000,000 bushels a year.

THE CANNING AND DRYING OF FRUITS

The Fruit-canning Industry.—Before the development of modern transportation, the canning and drying of fruit was a general household practice. A great deal of fruit is still canned in the home, though the home drying of apples and berries has almost disappeared. The importance of California as a fruit-canning center has already been mentioned. Fruit preserving and the manufacture of berry jams is an important industry in many other Pacific Coast fruit districts also. In spite of admirable conditions for fruit production, the handicap of distance is keenly felt in the Far West, particularly when good crops occur in the East. It is the canning industry which averts disaster at such a time. Gradually the domestic and foreign market for canned and preserved fruits has grown until the canneries regularly consume a large part of the output of Pacific Coast orchards and gardens. The eastern fruit growers have not been slow to see the economy of this practice, and fruit canneries have sprung up in many eastern districts, first to act as absorbers of the surplus in years of overproduction, and later to develop into a stable business.

Fruit drying is practiced mainly in California. In the eastern apple regions a good quality of dried apples is secured by the use of evaporating devices. Commercial drying establishments are numerous but small machines are also occasionally operated by the farmers. Most of the common fruits of the East are, however, too soft and pulpy and too low in sugar to be valuable when dried, and the cost of mechanical evaporation is too high to permit them to compete with fruit raised under California conditions and dried in the open air. Therein is clearly an industrial response to climate. The low rainfall and dry heat of the California summer makes possible the out-of-door drying of fruits on a vast scale. The fruit drying is done in the interior valleys where the atmospheric humidity is much lower than near the coast. The prune industry of Santa Clara County, the raisin drying of Fresno County, and the peach drying of Kings County are conspicuous examples. The favorable climatic conditions which exist in this region may be seen in a comparison of relative humidity, cloudiness, and rainfall records of these and other fruit-growing regions of the United States.

AVERAGE WEATHER CONDITIONS AFFECTING FRUIT DRYING, FOR THE SIX MONTHS, JUNE TO NOVEMBER, INCLUSIVE

Station	Rainfall, inches	Relative humidity, per cent	Sunshine, per cent of total possible
Rochester, N. Y.	17.0	74.0	53.0
Jacksonville, Fla.	33.6	81.0	58.0
San Francisco, Cal.	4.6	81.5	66.5
Fresno, Cal.	2.1	44.0	86.0

GRAPES AND RAISINS

Two Types of Grapes in America.—A study of the natural conditions affecting grape raising in North America involves two problems, for there are two kinds of grapes, with different geographic requirements. California grows principally the viniferous or European type of grapes. In the eastern part of the continent the many varieties of grapes are mainly of native origin. In colonial times attempts were made to introduce European grapes into English colonies, but without success, although wild grapes were found in abundance from Nova Scotia to Florida. Many years later it was discovered that, in addition to the unsuitable climate for south-European grapes, failure resulted from their susceptibility to fungus diseases induced by summer humidity and to the work of a root parasite (*Phylloxera*) to which native grapes were immune. Successful grape culture was finally assured for the East by the selection of improved types of native wild grapes rather than by introduction of types from Europe. Yet the Spanish were immediately successful in transplanting the Mediterranean vine to southern California. Thus two types of grape industries were established in North America.

Grape Districts of the East.—Although the vines of eastern grapes are hardy and seldom winter-kill, the late frosts of the northern spring may ruin a crop, or a short season may not permit the fruit to mature. Therefore, most of the commercial crop of the East is limited to four districts, the climates of which are tempered by lake influence. These are (1) southwestern Michigan; (2) the southern shore of Lake Erie, including the Chautauqua district which lies on the glacial lake plain north of the Allegheny Plateau escarpment; (3) the shore of Lake Ontario north of the Niagara escarpment from Hamilton, Ont., eastward into New York; and (4) the steep bluffs bordering the Finger Lakes of New York (Fig. 35). In the first three named, the Concord grape is the leading variety, and is a table grape only. It does not keep well, and the bulk of the crop must be consumed as soon as it is ripe; easy access to large markets is therefore essential. The market for Michigan grapes in Chicago and adjacent territory may be reached by rail or by water in a few hours. The Chautauqua grapes supply the eastern cities and sometimes reach the middle-western markets. In these regions grape juice factories have been established to provide a market for a surplus crop. None of the varieties of native grapes has sufficiently solid pulp and high sugar content to make satisfactory raisins.

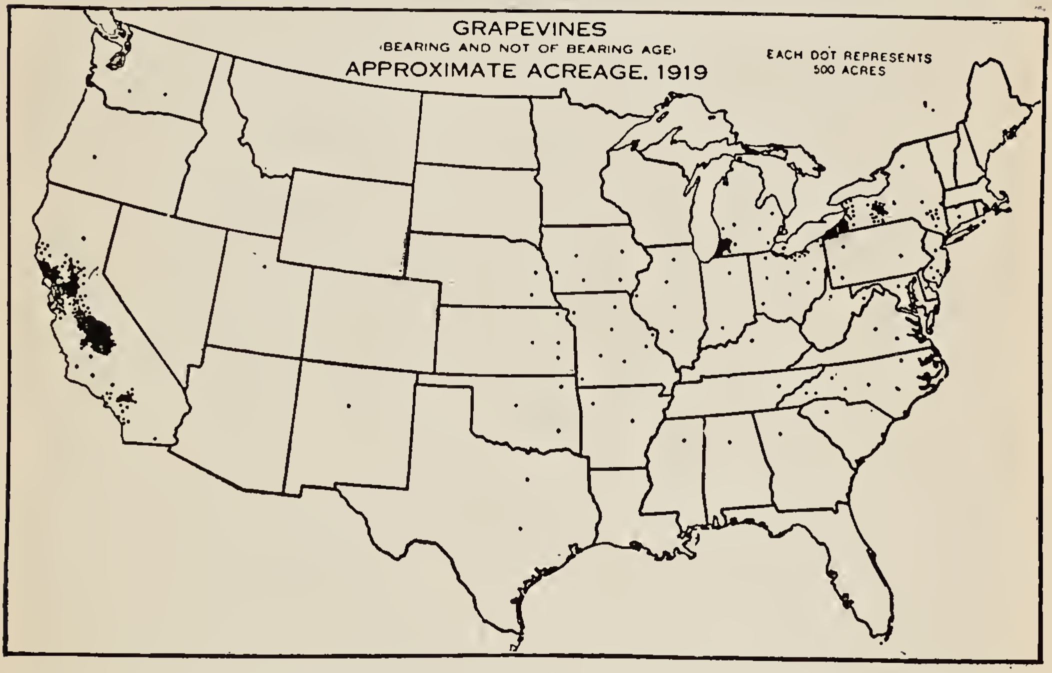
GRAPEVINES
(BEARING AND NOT OF BEARING AGE)
APPROXIMATE ACREAGE, 1919
EACH DOT REPRESENTS 500 ACRES

Fig. 35.—The principal grape-growing regions of the United States. In 1927 California produced 90 per cent of the total grape supply, of which nearly two thirds was made into raisins. (*U. S. Dept. Agr.*)

California Vineyards.—Grapes are grown on the borders of the Pacific Ocean from Mexico to British Columbia. The principal commercial vineyards are, however, in central California, back from the coast

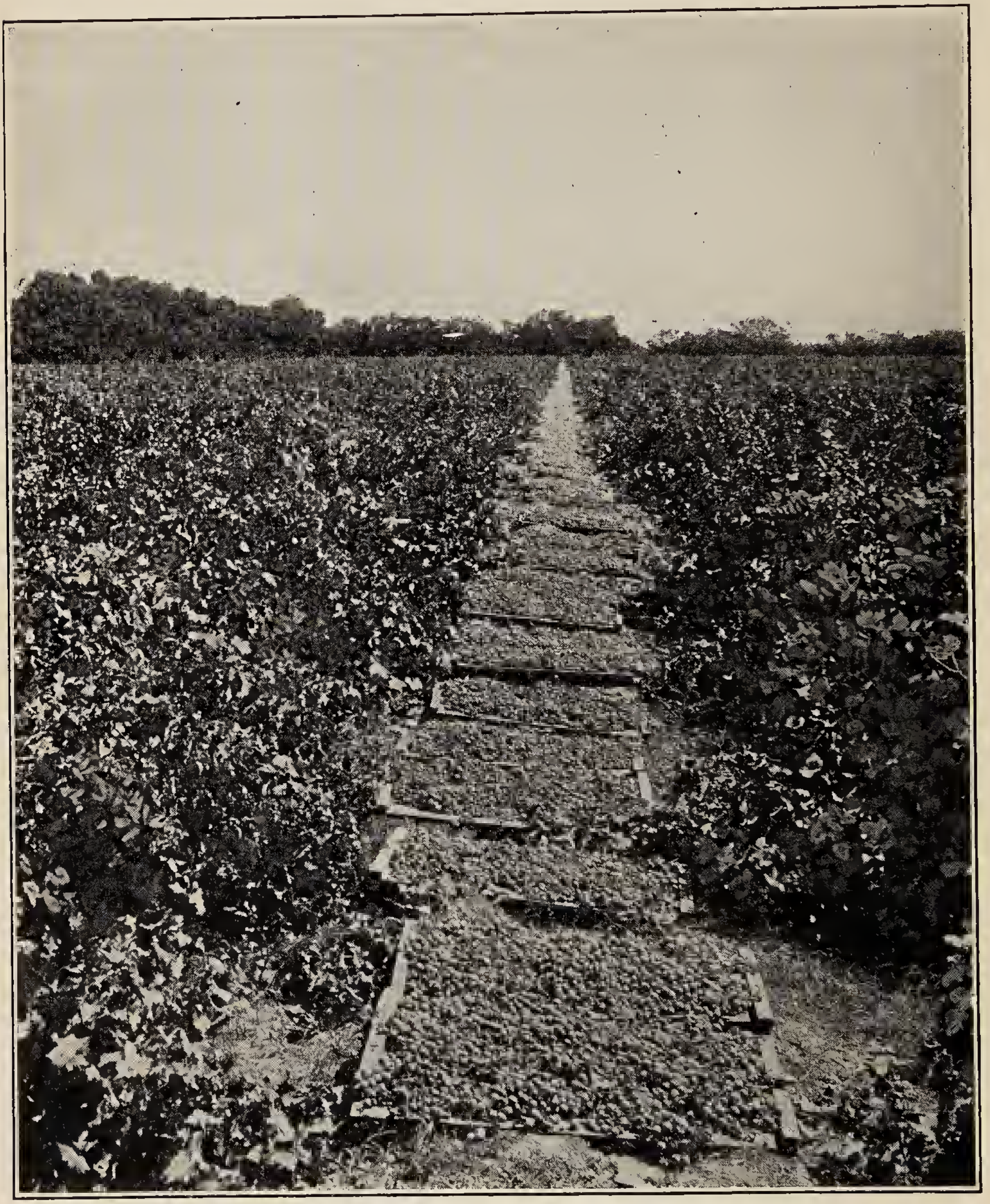

Fig. 36.—Trays of drying raisins in a California vineyard. The trays are tilted toward the south in east-west rows to get more direct sunlight. They must remain here from one to two weeks, a time when rain brings ruin. (*Courtesy of Sun-Maid Raisin Growers Assn.*)

with its fogs and humidity. Varieties of grapes are grown which are particularly suited (1) to shipment for use as table grapes, (2) to the manufacture of wines, and (3) to curing for raisins. All are of the wine-producing.

viniferous type which originated in southern Europe, and are by nature well suited to withstand the long dry summers of Mediterranean climate. However, the summer rainfall of the San Joaquin Valley is considerably less than it is even in the drier portion of Italy and Spain. For that reason most of the California vineyards require irrigation. Improved transportation has so encouraged the shipment of fresh California grapes that they are now sold in every eastern city and village. Similar grapes from Spain were formerly the chief source of winter supply in America.

Raisins are dried grapes (Fig. 36). Formerly only the earliest pickings of certain varieties were dried. The later fruit dries much more slowly and with more danger from rain, because of the approach of the lower temperatures and the greater rainfall of autumn. Four distinct types of raisins are made in California: (1) the large Muscat raisins which are sold in clusters and also as seeded raisins; (2) the Sultanina and Sultana, small raisins made from naturally seedless grapes; (3) the so-called English or Zante currants, which are made from a small seedless variety of grape obtained from Greece; and (4) an inferior class, called "dried grapes." The present crop of raisins averages more than 240,000 tons annually (nearly 4 pounds per capita). Although a considerable importation of foreign raisins continues, California is more than able to supply the normal demands of North America, and 75,000 tons have been exported in a single year. The principal raisin-drying district is located on the great alluvial fans near the western base of the Sierra Nevada mountains (see p. 70).

CITRUS FRUITS

The Origin of Citrus Fruits.—The principal citrus fruits of commercial importance are the orange, lemon, lime, and pomelo or grapefruit. All these fruits originated in the humid subtropics of southeastern Asia and have been cultivated elsewhere for a few centuries only. From southern Asia citrus fruits were introduced into Palestine and southern Europe. From Spain they were carried to the New World, including the United States, which now leads the world in quantity of fruit grown and in scientific methods of culture and marketing.

The Relation of Temperature to Citriculture.—The tropical origin of citrus trees is plainly manifested in their inability to withstand temperatures below freezing for more than a very few hours at a time without serious damage to the tree. The various citrus fruit trees differ in hardiness, the orange being the most resistant, followed in order by pomelo, lemon, and lime trees. In spite of the constant danger from frost, citrus fruits grown beyond the margin of the tropics are considered superior in flavor to those of the tropics. Citrus growers in America are often put to great expense and labor to protect their groves from frosts during cold spells in winter. The principal means of protection is the use of heaters among the trees on frosty nights. Conditions of temperature, therefore, limit sharply the possible citrus regions of the United States. Limes may be grown only at the southern tip of Florida. Lemons are grown only in southern Florida and southern California. Oranges grow in northern Florida, at various points on the Gulf Coast, and nearly to the northern end of the Valley of California. The districts of greatest importance will be seen in Figure 37. Each of the great citrus regions has been visited by destructive freezes, Florida in the winter of 1894-95, and California in 1912–13 and in 1921.

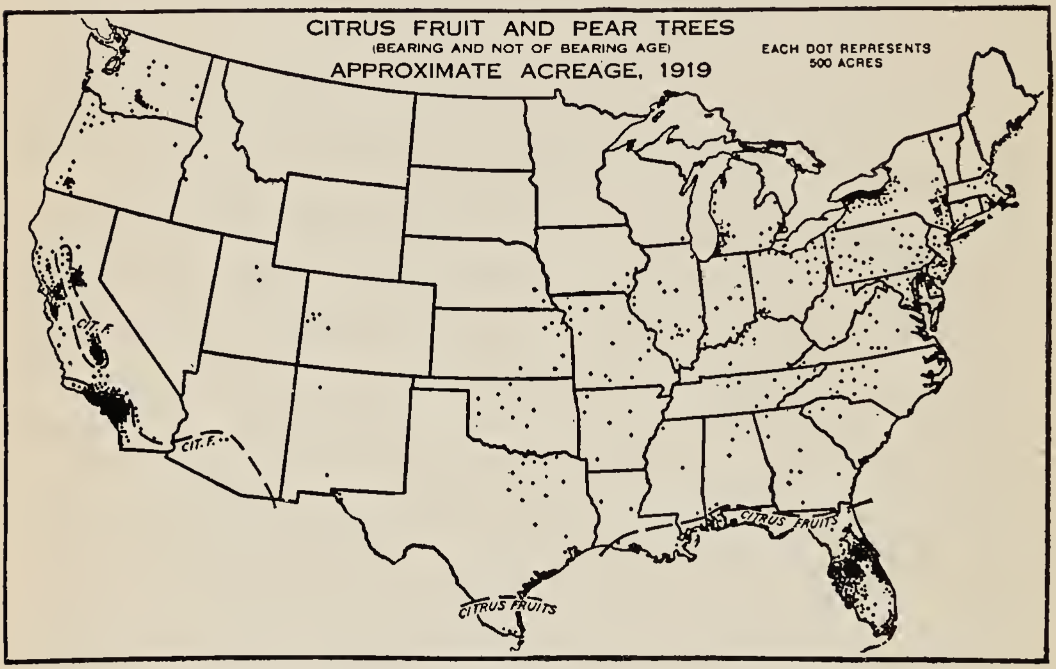
CITRUS FRUIT AND PEAR TREES
(BEARING AND NOT OF BEARING AGE)
APPROXIMATE ACREAGE, 1919
EACH DOT REPRESENTS 500 ACRES
CIT. F.
CIT. F.
CITRUS FRUITS
CITRUS FRUITS

Fig. 37.—In California oranges grow in the same latitude as central Illinois or Philadelphia, due to the marine influence on climate. (*U. S. Dept. Agr.*)

Moisture Influences.—It is worthy of note that the citrus fruits have several times been subjected to a change in their moisture environment. In their original removal from southeastern Asia to the Mediterranean region the change was from a region of abundant summer rainfall to one of summer drought, where irrigation was necessary to keep the trees alive. The transplanting of these fruits from Spain to Florida and to South America brought them back to a moisture environment similar to the original. When the navel orange of Brazil was established as the dominant variety of California, this influence was again reversed. Adaptability in this respect does not mean that the citrus fruits are entirely at home in the Mediterranean climate. That they are not is shown (1) by their sensitiveness to soil alkali, (2) by their large water requirement and the necessity for irrigation, even in parts of California where peaches thrive without it, and (3) by the fact that the dry air of the interior valleys of California causes the trees to be less productive than they are on the more humid coast. It is not unlikely that conditions of moisture, as well as those of topography, soil, and variety of tree have much to do with the well-known differences in flavor and appearance between California and Florida oranges.

Citrus Fruits Large and Important Crops.—An abundant supply of citrus fruits is an undoubted blessing to America. Although oranges are picked in both Florida and California throughout the year, the season of greatest abundance is the winter, in which other fresh fruits are scarce and expensive. Florida oranges begin to be abundant about November 1, and picking reaches its maximum in midwinter. The height of the picking season in California comes later in the winter, the Valencia variety constituting the principal summer crop. The total crop of oranges in America averages about 35 million boxes, of which nearly three-fourths are grown in California. Grapefruit and lemons are grown in both Florida and the arid southwest, lemons principally in California, and grapefruit in Florida and southern Texas. Large quantities of these fruits are also imported.

The Citrus Grower Dependent on Efficient Marketing.—It is obvious that the growers of citrus fruit are dependent upon the large city markets of the northeastern states from which they are 1,200 to 3,000 miles distant. Although the citrus fruits, protected by thick oily skins, were imported from Mediterranean Europe and the West Indies a century ago, losses were large and prices high. The development of a great domestic industry awaited the perfection of rapid transportation and of methods of protection against unfavorable weather and other damage in transit. The average time for the transit of cars of oranges between California and New York is about two weeks. In warm weather the cars require refrigeration, and in very cold weather protection from frost. Shipments of California fruit are also being marketed in the East by way of the Panama Canal.

The average citrus fruit grower has a small farm but a large investment, for fruit land is valuable and in California additional expenditures for irrigation are required. At best, the margin of profit is small and there are many failures. Under these conditions the small growers have sought protection from the disadvantages of their relation to market by highly scientific methods, by demanding a protective tariff, and by combining in organizations such as the California Fruit Growers' Exchange and the Citrus Protective League. The latter is an organization which deals with legal and political matters and with policies relating to the industry as a whole. Similar organizations have also been developed in Florida. The former is designed to promote efficiency in the grading and packing of fruit and to act as a clearing house through which fruit may be effectively marketed. The supervision of this organization does not end with the shipment of the fruit, but through its agents it guides each car to a profitable market and handles its sale for the grower. Under the direction of these organizations, citrus by-products industries have been established which, as has been noted for other fruits, help to absorb surplus or inferior fruit and to steady the market.

MINOR FRUIT AND NUT CROPS

Some crops of great value, originally wild, are now cultivated to a considerable extent in America. Such a crop is the pecan. Many other foreign crops have been introduced. Only a few, however, are of much significance or are so concentrated in area as to be recognized as industries. Those crops which have become important in these respects are not the new and untried plants of the tropics, but are the fruits and nuts to which the European taste is accustomed and of which large quantities are imported into North America. They have been introduced, mainly into California, since the development of efficient transportation which enables them to compete with similar goods from overseas. Figs, olives, walnuts, and almonds, all grown in the dry climate of the West, compete with those of the Mediterranean countries. Dates grown on the hot, irrigated desert of the Imperial Valley yield fruits no less valuable than those of Mesopotamia, but as yet in small quantities.

The plant explorers of the United States Department of Agriculture are searching the world for new plants, and for new varieties of old plants which may be well adapted to American geographic conditions. Doubtless, a few generations will add many valuable items to this already long list of American fruit and nut crops.

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CHAPTER VI

SUGAR, VEGETABLE OILS, AND TOBACCO

SUGAR

The Sugar Supply of North America.—The use of a large quantity of sugar by a people, like the use of white bread, reflects general wealth and a high standard of living. Some of the new countries and most of the industrial countries of the world rank high in this respect; among them the United States and Canada (Fig. 38). In 1900 the average per capita consumption of sugar in the United States was about 70 pounds. The rate of consumption has risen steadily with increasing national wealth and in 1927 the average American used 103 pounds of sugar. In Canada also the rate of consumption is high. It is obvious that the total quantity of sugar required for the two countries is very large; it has amounted in recent years to nearly 14 billions of pounds. Of this vast amount barely 15 per cent is grown at home, about 30 per cent is obtained from Hawaii, Porto Rico, and the Philippine Islands, and more than 50 per cent is imported from foreign countries, mainly from Cuba (Fig. 39).

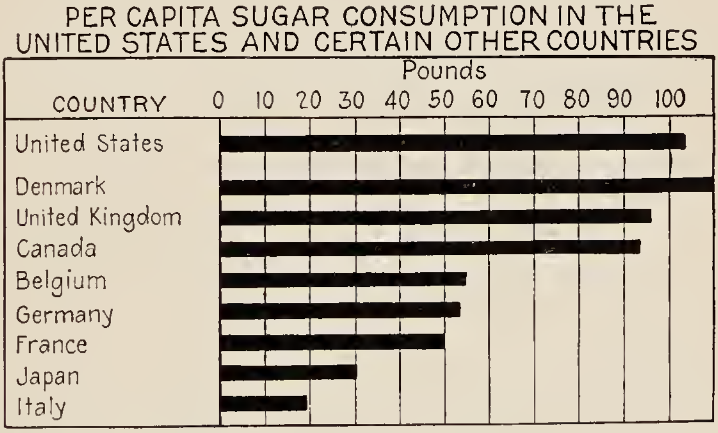

FIG. 38.—Figures are computed from published estimates on raw sugar consumption the year 1927–28, and, are reduced to terms of refined sugar.

The American Cane-sugar Crop.—Sugar cane is a tropical plant and requires nearly a year of warm weather to reach maturity. It requires also a fertile soil and 50 inches or more of rainfall each year. Nowhere in the United States or Canada are these geographic conditions combined except in parts of the Gulf Coastal Plain (Fig. 40). The principal cane-growing district is the fertile alluvial soils of the Mississippi delta region of Louisiana, where cheap negro labor helps to make possible an unequal sort of competition with tropical cane growers who are more favored by nature. In Louisiana frosts occur annually and, although early varieties of cane are grown which may be harvested in 8 months, the pieces of cane to be used for replanting must be protected from frost and a new crop started each spring. This is much more expensive than the cropping methods employed in Cuba, for example. Yields of sugar in Louisiana are commonly decreased by the fact that weather conditions force the cutting of immature cane, from which a full yield of crystallizable sugar can not be obtained. As a result of these natural handicaps Louisiana sugar planters are generally insistent upon a sugar tariff which will offset the disadvantages of their geographical position and other handicaps. The cane sugar grown in the United States is only about 1 per cent of the total quantity of sugar used in the country.

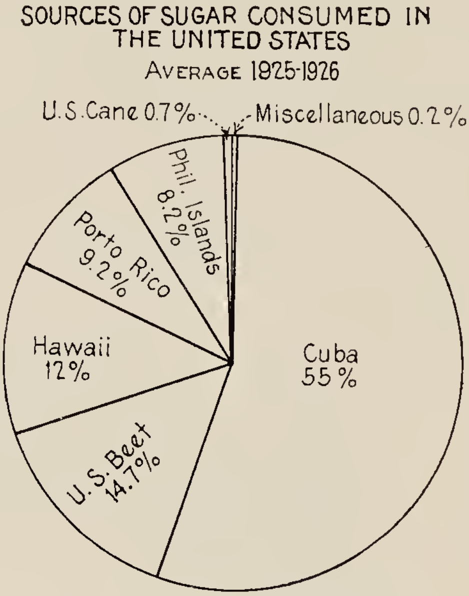

Fig. 39.—More than half of the sugar supply of the United States comes from Cuba.

Sugar Manufacture.—The extraction of the sugar from American cane is done in local mills. As the cane comes from the fields, it is bulky and easily damaged and may not be transported far. Unlike beet sugar factories, the cane sugar mills do not make refined sugar, but a soft, brown or yellow product called "raw sugar." The raw sugar of Louisiana, like most imported sugar, requires refining before it is marketed.

Sugar Refining.—The process of sugar refining consists of dissolving the raw sugar, clarifying it by the use of bone charcoal, and the filtering and recrystallizing of the sugar from the solution. Refining is done on a vast scale and so cheaply that the process adds but little to the final cost of the sugar. The great refineries run night and day, and one of the largest has a daily capacity of more than 4 million pounds of sugar.

1. easily crumbled

The output of the American Sugar Refining Company from its several factories amounts to more than 50,000 carloads annually. So vast a business may not be profitably located in the sugar growing districts. Rather, the refinery must stand at a great commercial gateway to a large consuming region. Here raw sugar from any of the producing regions of the world may be concentrated every month of the year in a never-ending stream, and in the most modern plants it is discharged from the ship's hold directly into the melting pans of the refinery. The great refineries of America are found in or near Boston, Brooklyn, Philadelphia, Baltimore, New Orleans, and San Francisco.

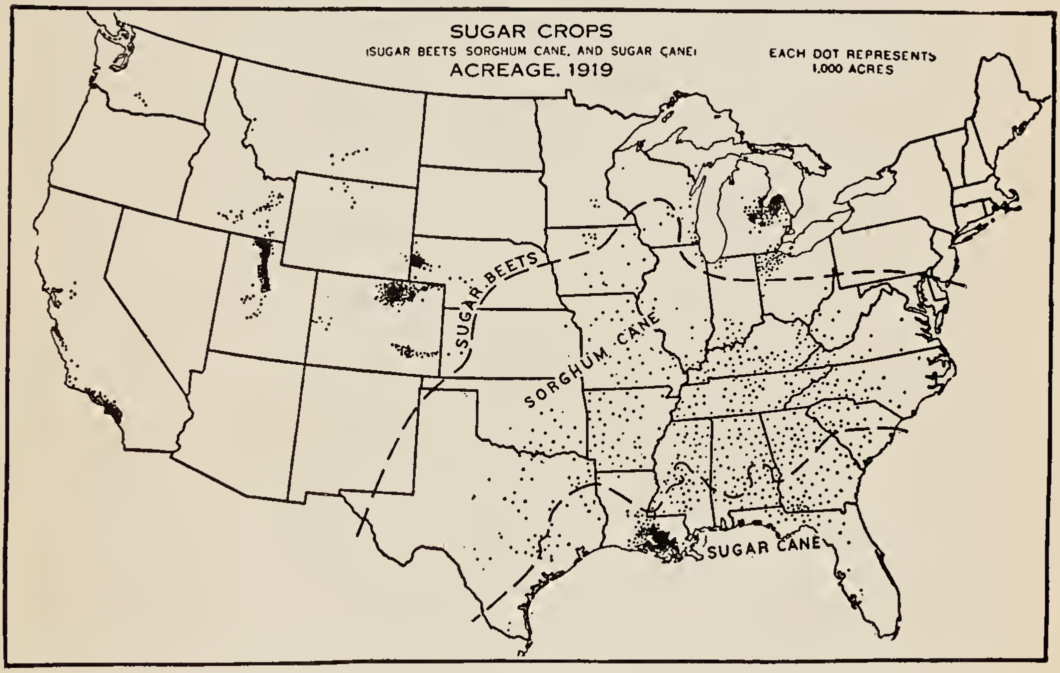
SUGAR CROPS
(SUGAR BEETS SORGHUM CANE, AND SUGAR CANE)
ACREAGE. 1919
EACH DOT REPRESENTS 1,000 ACRES
SUGAR BEETS
SORGHUM CANE
SUGAR CANE

Fig. 40.—The zoning of sugar crops in North America is due in part to climatic influences. (*U. S. Dept. Agr.*)

The prompt distribution of the sugar from these refineries to the inland markets calls for the superior railway service obtainable at these great commercial gateways. The packing of the sugar requires many millions of bags and barrels, and at least one sugar-refining company owns extensive timber lands, does its own lumbering, and maintains its own cooperage shops in which hundreds of thousands of sugar barrels are made annually.

Beet Sugar.—Sugar beets are grown under a wide variety of climatic and soil conditions. In general, the most suitable geographic conditions for sugar beet growing are found where the soil is deep, friable, and well drained; where, except in irrigated regions, there is a moderate and well-distributed summer rainfall; and where the summer temperatures are somewhat lower than those required for corn. Young beets are easily frosted, but since they grow rapidly, planting may be delayed until danger of frost is past. Mature beets are very hardy, and cool autumn nights alternating with warm bright days increase their sugar content. Shallow soils and excessive moisture cause ill-shaped roots and decreased yields.

The sugar-beet regions of North America stretch westward from Ontario through Michigan, Wisconsin, northern Iowa, Nebraska, Colorado, Utah, Idaho, and California (Fig. 40). In the western half of this long belt the beets are grown under irrigation. Because of the farmers' ability to control more closely the conditions of beet growth and because of their larger factories, the western regions can produce sugar more cheaply than the eastern, but the latter has the advantage of a nearer market. It will be noted that the sugar-beet belt is located along Note the cool northern margin and on the dry western side of the corn belt. The heat of the corn belt is partly responsible for this location, but the competition of beets and corn for the time and labor of the farmer is also an important factor. Beets require a great deal of hand work. It is not often that there is enough resident labor in an important beet region to tend the crop. Outside laborers, often foreign-born, are drawn from the cities, to which they return in the winter to work in factories. Many of these people emigrated from the beet-growing districts of Europe and are already familiar with the care of the crop. Russians, Poles, and Bohemians in the East, and Mexicans in the western districts contribute a large part of the labor. The entire family usually works as a unit and undertakes to care for a certain area of beets. Sometimes the laborer rents or buys land and becomes a permanent resident in the community.

An average acre of beet land yields from 9 to 11 tons of roots of which 13 to 18 per cent by weight is recovered in the form of sugar. It is clear that so large a bulk of unproductive water and cellulose will increase the cost of the sugar very greatly if the beets are shipped more than a few score of miles. N.B. For that reason beet-sugar factories are located at various points in the regions of beet growing (Fig. 41). They draw their raw materials from the immediate region by wagon transportation, and by rail from outlying sections up to 100 or 200 miles distant.

Minor Sugar Crops.—In the broad zone between the sugar-beet belt and the commercial cane-sugar region of North America, sugar cane and sorghum cane are raised locally on a small scale and their juices are reduced to syrup and molasses in rural mills. These crops are mainly for home supply although sorghum molasses is expanding its market and may now be obtained in convenient canned form. More than 30 million gallons are made annually in the United States.

In northeastern United States and adjacent provinces of Canada, Note maple trees yield a very considerable addition to the sugar supply of the continent. In the United States about 3 million pounds of maple sugar

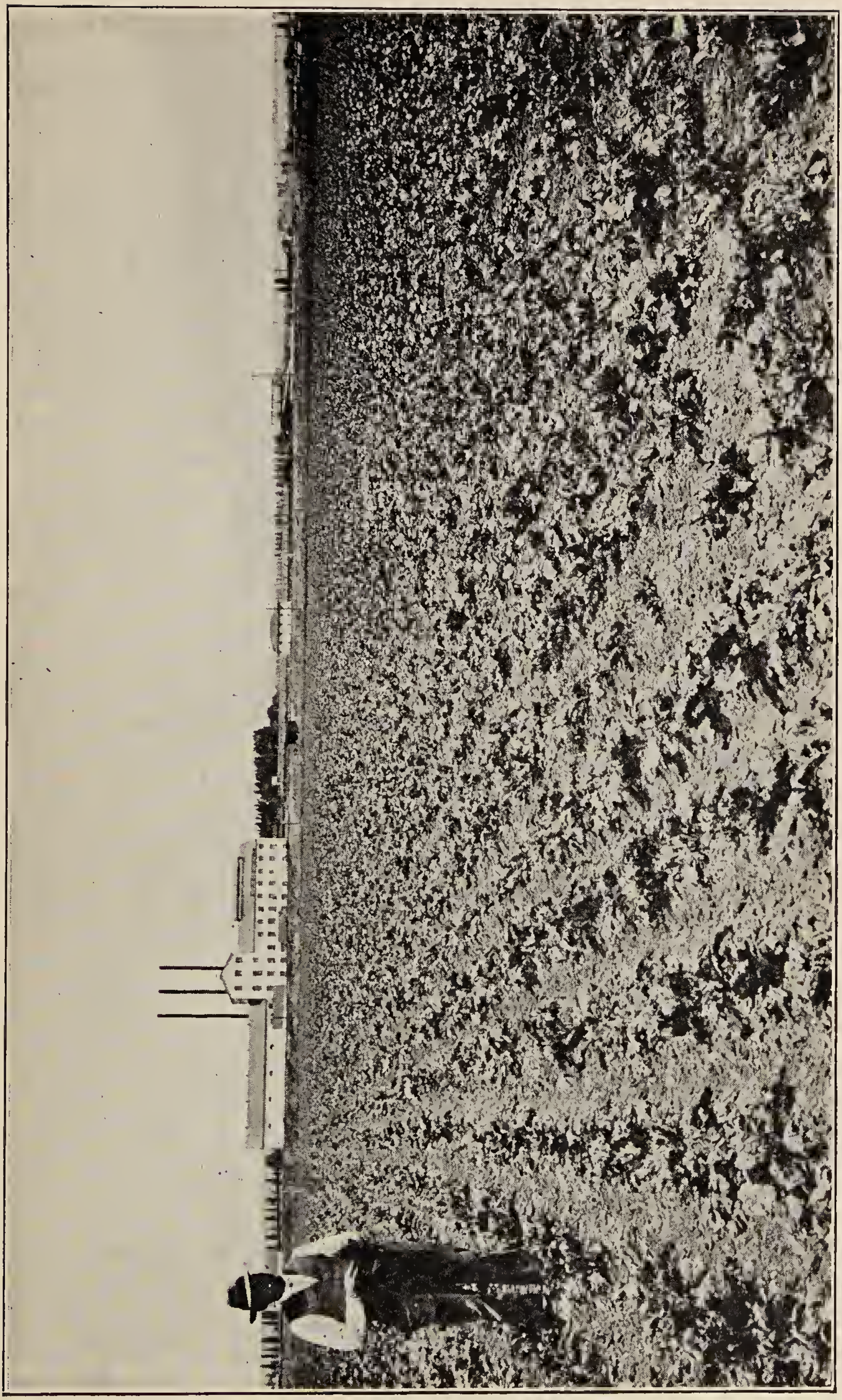

Fig. 41.—A sugar beet field and factory in Utah. Raw-material for this factory is close at hand. (*U. S. Dept. Agr.*)

and 3 million gallons of maple syrup are made annually, mainly on the hilly farms of Vermont and New York. Canada, mainly Quebec, produces more maple sugar than the United States and about one-half as much syrup.

VEGETABLE OILS

Vegetable Oils of Increasing Importance.—Fat is an important part of the human diet. Pure fat has a fuel value of about 4,000 calories per pound, while the cereals possess less than 2,000 calories per pound. As a heat-producing food, therefore, fat, in moderate quantities, is necessary. It is essential in cold climates but it is a common element of diet also among people of the tropics.

Edible fats are obtained from both animal and vegetable sources. In some parts of the world vegetable fats have been in common use for many centuries. Yet among the races of northwestern Europe, and their American descendants, the fats in common use have until recently been of animal origin, principally lard, tallow, and butter. That is due, no doubt, to the lack of any important oil-seed crop in the agriculture of northwestern Europe. In the densely peopled Oriental lands, especially where religion forbids the use of flesh, and in the Mediterranean countries, the oils of the olive, the soy bean, and many other seeds have supplied the principal edible fats. As long as western Europe and the new world remained dominantly agricultural in occupation, the supplies of animal fats remained sufficient. But the growth of industrial populations in the last quarter of the past century brought that era to a close. The wide commercial interests of Britain brought cheap meats to her cities and caused her to feel the pinch of a fat shortage less quickly than did France and Germany. It was therefore the latter countries which took active steps to develop great vegetable-oil industries. Gradually the shortage made itself felt in Britain, and as the cost of lard and butter advanced, cheaper fats of vegetable origin grew in popularity. In America the same transition gradually came about. Even while American exports of lard were mounting to enormous totals, vegetable cooking fats began to appear; and while butter was being made in greater quantity and of better quality than ever before, substitutes for butter found a market.

Classes of Vegetable Oils.—There are now in common use more than a dozen vegetable oils, some of them subdivided into numerous market classes and grades. Some are classed as edible, others as inedible. In fact, edibility is largely a matter of price and degree of refinement, and these grades are to a considerable extent interchangeable. An industrial classification of oils is commonly made on a basis of their drying qualities. Some oils, such as linseed and Chinese nut oils, when exposed to the air, absorb oxygen rapidly and form a tough, rubbery film. These are known as the "drying oils" and are used mainly in the manufacture of paint and varnish. Other oils, such as cottonseed oil and olive oil, oxidize very slowly and are called "non-drying oils." There is nearly complete gradation between these two extremes; soy-bean oil, for example, called "semi-drying," is of intermediate character.

Cottonseed Oil.—About two-thirds of the weight of unginned cotton consists of seeds which yield 16 per cent of their weight in oil. For decades this vast and growing resource was little used. Some of the seed was returned to the land as fertilizer and a little was fed to animals, but a much greater quantity was burned or permitted to decay. Before the Civil War a little cottonseed oil was made in the United States but as late as 1875 only about 5 per cent of the 2 million tons of seed ginned annually was treated in the crushing mills. About 75 per cent of the annual crop of cotton seed, or nearly 5 million tons, now goes to the mills. The total annual yield is nearly 14 pounds of valuable oil for every person in the United States, besides more than 2½ million tons of cottonseed cake, and other important by-products. Since the seed is bulky, the crushing mills are most advantageously located close to the supply of raw material. More than 550 such mills are scattered throughout the cotton belt.

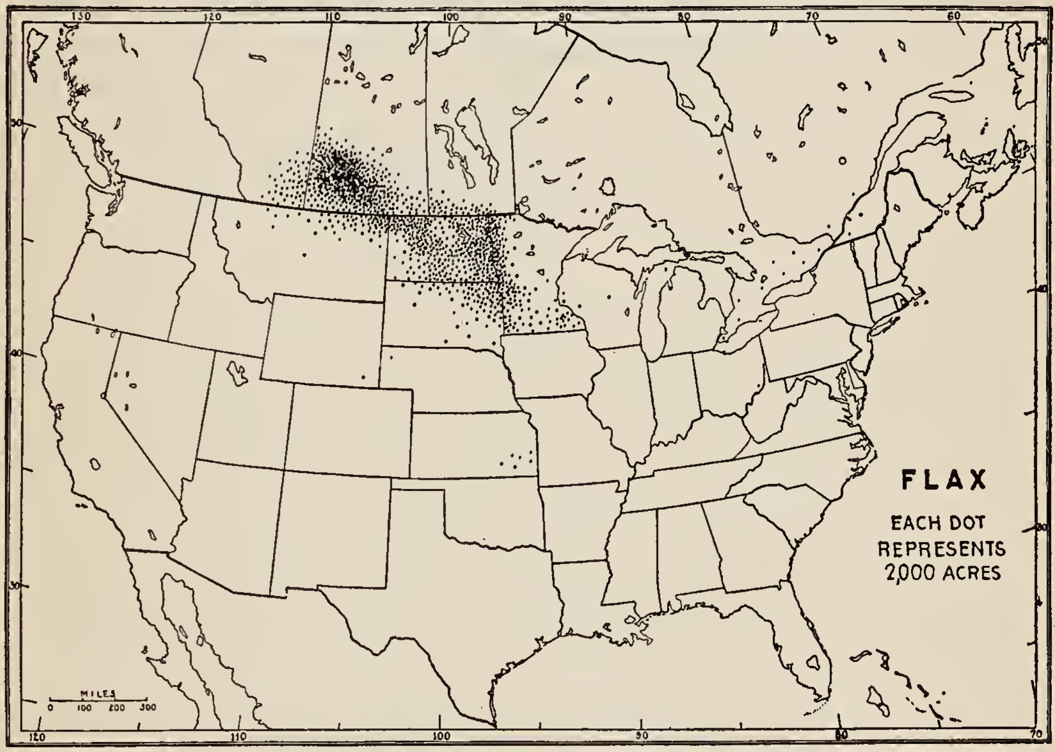

FIG. 42.—Flax, raised for seed, is one of the field crops of the spring-wheat region.

does not extend so far into Alta as spring wheat region

As the oil comes from the presses it is not suitable for human consumption but requires clarifying and refining, processes which separate it into a number of products suited to different uses. Cottonseed oil is non-drying; its light, clear products are used directly as salad oil or in solid form as lard substitutes. The latter are mixtures of liquid cottonseed oil with solid animal fats, or they are made by treating the light oil with hydrogen, which turns it into a solid fat. The inedible products of the refinery serve as raw materials in the manufacture of soaps and chemicals. Refining is most economically done on a large scale; the crude oil from the small crushing mills is, therefore, commonly shipped in tank cars to refineries which are located in large southern cities or in the industrial centers of the North. Much of the cottonseed cake is used for animal feeding in the South, but since it is rendered compact by pressure it also is shipped in large quantities to distant consumers.

Linseed oil is obtained from the seed of the flax plant. In North America the crop is grown almost entirely for its seed. It is treated as a spring-sown cereal; drilled, harvested, and threshed by the same machinery as that used for wheat. The region of American flax growing is practically that of the spring-wheat belt of the Central Plains (Fig. 42). The largest areas are found in Minnesota, the Dakotas, and Saskatchewan. Flax is a slow-growing crop and is easily crowded out by weeds. Also it is subject to disease when grown continuously on the same land. For these reasons it does best on newly-turned prairie sod and is a common pioneer crop in the Northwest and is followed by the cereals. As the supply of new land in the United States has decreased the flax seed crop has not been able to expand with the market. The present crop of 25 million bushels is less than that of 25 years ago. The Canadian crop is about one-third that of the United States.

Flaxseed is valuable and easily handled and is crushed for the extraction of its oil in large mills, often far distant from the flax fields. In this respect also the flaxseed resembles wheat rather than cottonseed. The principal mills are found in Minneapolis, Toledo, and Buffalo. Instead of the large number of mills required to handle the cottonseed crop, the entire flaxseed crop is handled by about 25 establishments. The method of milling is similar to that employed for other oil seeds, and the cake from the presses has likewise a high value as a concentrated feed for livestock.

Although linseed oil is used to some extent for food in Russia and India, its sole use in America is industrial. Its drying property makes it a convenient binder in many preparations, such as paint, varnish, linoleum, oilcloth, patent leather finish, and printers' ink. The high cost of other items entering these industrial wares in which linseed oil is a binding substance permits their manufacture in localities quite unrelated to the centers of oil production.

America is the world's largest user of linseed oil. Due to the abundance of our forest resources, frame buildings are more numerous and the use of paint is more common than in any other country. In recent years the combined linseed crops of the United States and Canada have generally been insufficient for domestic needs and nearly half as much more is usually imported from Argentina. Importation into the United States is in part counterbalanced by large exports of linseed oil and mixed paints.

Oils from Imported Seeds.—Rapid growth in the sale of vegetable-oil substitutes for lard and butter has encouraged the use of domestic seeds, such as corn, peanuts, and the soy bean, for oil production. It has also led to the importation of these and other oil seeds, and copra, from many parts of the world. Fortunately, these raw materials require treatment but little different from the seeds of cotton or flax. The mills dealing with the latter are seldom fully employed throughout the year, and by slight modification of their equipment they can crush and press peanuts, beans, or copra. The best peanut oil is used directly as salad oil, while the others are made edible by refining or are used industrially. In addition to the oil seeds which are imported, economy of ship space has encouraged the importation of oils pressed from these seeds in foreign lands; for example, soy-bean oil from Japan and coconut oil from the Philippines.

TOBACCO

Origin and Uses of Tobacco.—Tobacco is an American plant. When America was discovered the use of the leaf was an immemorial custom among the natives of both continents. Tobacco cultivation was introduced into Europe by the Spanish, but the practice of smoking was introduced through England and spread rapidly to the rest of the continent. This created a great market for tobacco, which at that time was supplied mainly from the plantations of the Virginia colony. The first exported crop of tobacco in 1618 amounted to 20,000 pounds, in 1695 it was 20 million pounds. The crop was of such importance in Virginia that bundles of tobacco leaves served as currency, while the shipments to England served to provide necessities and luxuries for the growing colony.

The tobaccos grown in North America may be grouped into three general classes. (1) cigar leaf, (2) manufacturing types, and (3) the export types. Three types of leaf tobacco are used in the manufacture of cigars, namely, fillers, wrappers, and binders. Manufacturing types are those used in making smoking mixtures, cigarettes, chewing tobaccos, and snuff. Exported tobaccos are similar to these, and often the same varieties are employed for either purpose.

America the Principal Source of Tobacco.—Few plants are more sensitive to conditions of climate and soil than is tobacco. Nevertheless, few are less restricted in distribution by those same conditions. It is the peculiar market quality of the leaf rather than the growth of the plant which reflects geographical conditions. Tobacco is successfully grown from Canada to Argentina and from China to Australia. In this broad range, small areas in many types of climatic and soil situations grow leaves of special characteristics which cause them to be exported to other parts of the world. The Havana fillers of Cuba, the wrapper leaf of Sumatra, and the cigarette tobacco of Macedonia and Asia Minor are notable examples. The United States remains, however, the most important country in the growing of tobacco (Fig. 43). The annual crop of 1 to 1½ billions of pounds is about 40 per cent of the crop of the world. A small quantity is raised also in Ontario and Quebec.

40%

It has long been believed that tobacco is very destructive of soil fertility. It requires a fertile soil of high humus content and may be grown profitably only a very few times in succession on the same land. Recent investigations have shown, however, that the crop does not remove more of the mineral elements of fertility than do other crops and that its failure is due more often to a root disease. In regions of heavy soil and rolling topography, such as the Kentucky Bluegrass, the finely pulverized condition of the soil necessary for tobacco culture hastens soil erosion, and newly-plowed grass lands planted in tobacco may be stripped of soil and ruined in a season or two.

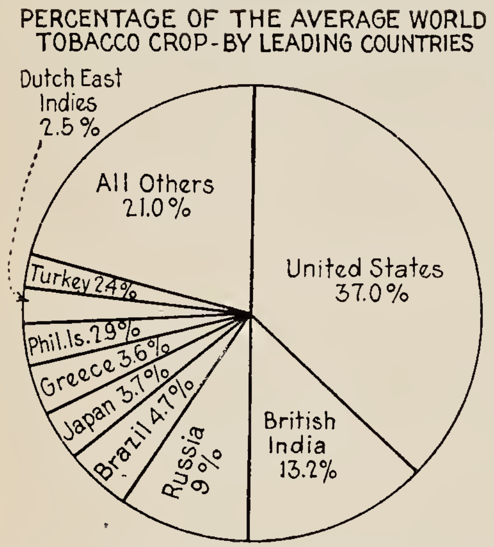

Fig. 43.—The United States is the world's leading tobacco producer.

American Tobacco Regions.—There is so large an area of soils suitable to tobacco in the United States that overproduction is very easy. Only those soils which have demonstrated their ability to grow leaf of a desired type are employed (Fig. 44). It is apparently soil much more than climate which determines the texture of the leaf. Thin elastic leaves for cigar wrappers are grown, largely under artificial shade, in the Connecticut Valley, in Georgia, and in Florida, but on light soils of low clay content and low water-holding capacity. Binder-leaf districts are found in Wisconsin, New York, and Pennsylvania, but on sandy loams or light silt loams. Cigar fillers are also grown in Pennsylvania, New York, Ohio, Georgia, and Florida, but on stronger soils of higher clay content and moisture-holding capacity. It is believed that conditions of climate have much to do with the aroma and flavor of tobacco.

Cigar leaf forms barely 10 per cent of the total American tobacco crop; the manufacturing and export types occupy much larger areas. There are a dozen or more important types of tobacco in these general classes, the differences among them being due to climate, soil, variety of plant, and method of curing. The more important are: (1) dark, fire-cured, export leaf, grown on heavy soils in western Kentucky and Tennessee and in central Virginia; (2) white Burley, especially suitable for the manufacture of chewing tobacco and for export and most grown on the limestone soils of the Bluegrass region of Kentucky and in southern Ohio; (3) yellow, or flue-cured tobacco, used in cigarette and smoking tobacco manufacture, grown on light soils in the Carolinas and southern Virginia (Fig. 45).

Tobacco Manufacture.—The manufacture of cigarettes and of smoking and chewing tobaccos consists largely of mechanical processes which lend themselves to large-scale factory management. In cigar manufacture principally the cheaper grades are machine made. Expensive cigars are made almost entirely by hand. In the past this industry has been widely distributed; the number of cigar factories is however rapidly decreasing. The small factory is giving way to larger shops which can (1) standardize their cigars by being large buyers and by getting the select leaf tobacco, (2) effect savings in labor by introducing division of labor and supplementary machinery, and (3) do more effective advertising. Large shops of this sort are located in large cities, principally Philadelphia, to take advantage of the labor supply, or in Florida where Cuban labor can be induced to settle. The number of cigars made annually in the United States is about 7 or 8 billions.

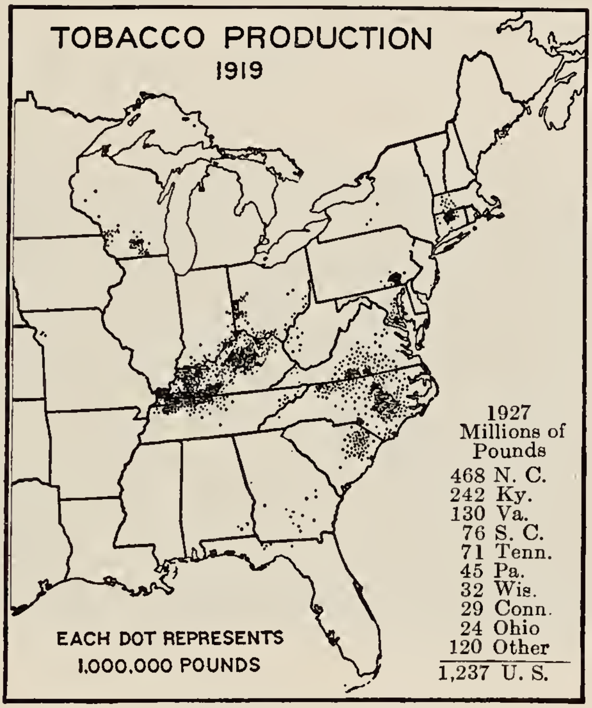

Fig. 44.—The lead in tobacco production has shifted in recent years from Kentucky to the Atlantic coast states.

The American cigarette industry increased greatly during and after the World War. The 1928 output of approximately 111 billions of cigarettes was about seven times that of 1913. Cigarette manufacture is a machine process and requires only cheap labor. On this account the factories are fewer in number and larger in size than cigar factories. About half of the total cigarette output is made in the cigarette-tobacco district of North Carolina, of which Winston-Salem and Durham are the principal centers. Other important manufacturing centers are New York, Philadelphia, and Richmond.

Smoking and chewing tobaccos and snuff are manufactured near the centers of tobacco production. Although some imported tobaccos are used for blending in these products, the bulk of the raw material is of domestic origin. Three centers, St. Louis, Louisville, and Winston-Salem and Durham, N. C., handle more than half of the total business. The necessity for large capital in the establishment of a tobacco manufactory has led to the formation of powerful corporations which assumed the proportions of trusts and required government control.

FIG. 45.—A field of "flue-cured" cigarette tobacco on the rolling surface of the Piedmont in North Carolina. (*U. S. Dept. Agr.*)

Foreign Trade in Tobacco.—Exports of American tobacco are large. The principal item of export is leaf tobacco of which about ½ billion pounds, or 40 per cent of the crop, is shipped to all parts of the world. The largest buyers are the United Kingdom and other west-European countries. In many countries the manufacture of tobacco is a government monopoly and imports of manufactured tobaccos are restricted. There are, however, about 10 millions of pounds of manufactured smoking and chewing tobacco exported annually, the principal purchasers being the same west-European countries.

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CHAPTER VII

VEGETABLE FIBERS AND TEXTILES

Cotton Growing

Cotton a Commercial Staple.—The spinning of cotton fiber and the weaving of cotton cloth is a very ancient industry. Plants closely related to modern American cotton grow in many parts of the old world and their fibers have been spun and woven in the Orient for many centuries. Yet before cotton could attain world significance it was necessary to wait upon inventive genius. The Oriental hand method of removing the seeds from cotton was too expensive in the western world. Machines were required to replace hand labor in ginning. The use of the cotton gin and the application of mechanical power to spinning and weaving began in the latter part of the eighteenth century.

Cotton growing in America had its origin with the colonial settlers of the South Atlantic states. Its use was, however, limited mainly to the making of homespun cloth until the close of the American Revolution. At that time a regular foreign trade in cotton began and it was greatly increased following the invention of the cotton gin in 1793. The influence of this machine upon cotton growing is seen in the fact that the total American cotton crop of 1791 was only about 4,000 bales, while 19 years later it had increased to 100,000 bales. The present American cotton crop averages about 12 million bales, (which is more than half of the total cotton crop of the world) (Fig. 46). Note

The preeminence of the United States in cotton growing is due to a combination of favorable conditions. The world has for 60 years been searched, particularly by British interests, for other possible cotton-growing regions which shall make the British spinners less dependent upon the American cotton supply. As yet, the search has been rewarded with only a very moderate degree of success. The conditions which enable the United States to retain its leading position are both geographic and economic. ote

Climate and Cotton.—The cotton plant is a woody shrub of tropical origin. Some varieties still growing in the tropics are perennial and attain treelike forms. In the American cotton belt, however, the occurrence of freezing winter weather makes it necessary to treat the crop as an annual. (The slow-growing, woody plant does not come to maturity so quickly as the cereals and does not prove profitable where the frostless season averages much less than 200 days in length.) Not only must

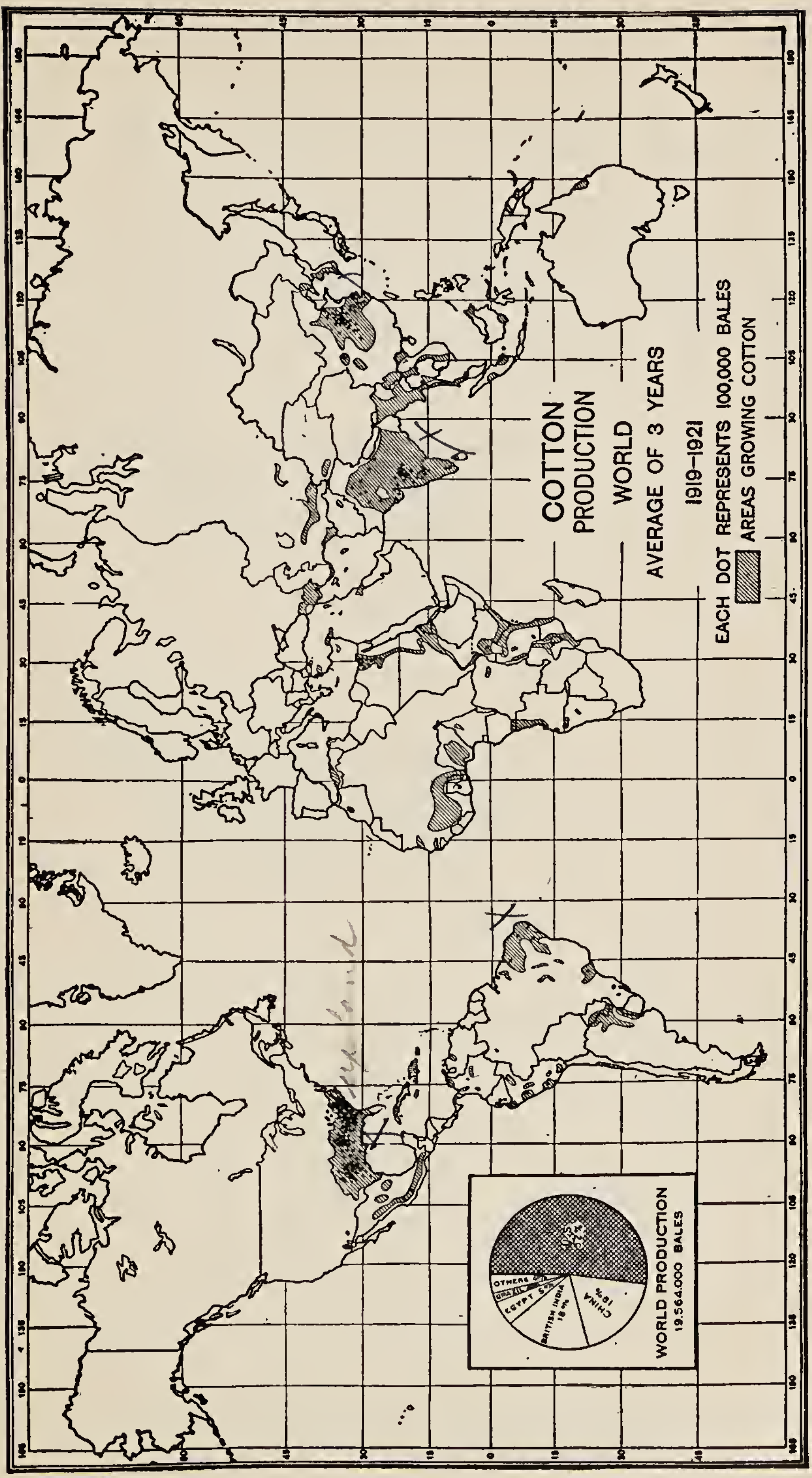

COTTON
PRODUCTION
WORLD
AVERAGE OF 3 YEARS
1919–1921
EACH DOT REPRESENTS 100,000 BALES
AREAS GROWING COTTON
WORLD PRODUCTION
19,564,000 BALES
OTHERS
BRAZIL
EGYPT 5%
BRITISH INDIA 18%
CHINA 10%

FIG. 46.—Specialization in cotton gives the American cotton belt the place of first importance among the world's cotton-producing regions. (*U. S. Dept. Agr.*)

the growing season for cotton be long, but it must be warm and moist. In nearly all of the cotton belt the summer temperature averages at least 77°F. The western margin of the cotton-growing section, except where the crop is irrigated, nearly coincides with the annual rainfall line of 22 inches. Farther east the annual rainfall is as much as 60 inches in parts of the cotton belt. In general, the rainfall is of the thunder-shower type, interspersed with abundant sunshine. It is usually more abundant in the spring and summer months than in the autumn. This condition is particularly favorable to cotton growing, since frequent rains in the autumn discolor the cotton of the opening bolls and interfere with picking.

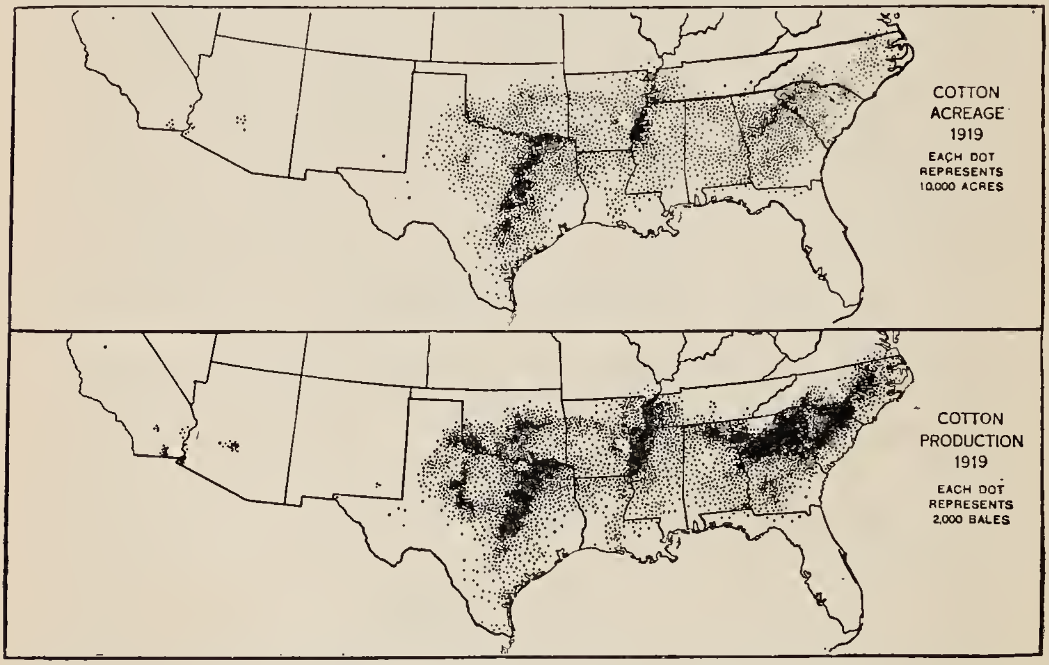

COTTON ACREAGE 1919
EACH DOT REPRESENTS 10,000 ACRES
COTTON PRODUCTION 1919
EACH DOT REPRESENTS 2,000 BALES

FIG. 47.—The contrast between cotton acreage and cotton production indicates the relative intensiveness of cultivation in various parts of the cotton belt. (*U. S. Dept. Agr.*)

Note

In Florida and on the entire coastal margin of the southern states, autumn rains are more abundant than farther inland, reaching 10 to 20 inches as compared with 6 to 10 inches in the cotton belt. This is one reason why very little cotton is grown in the coastal strip.

Important Districts in the American Cotton Belt.—Within the temperature and rainfall boundaries stated above, cotton is as generally grown as is wheat between Colorado and Maryland. Figure 47 shows, however, that there are several districts in which the proportion of the total area planted to cotton is higher than the average. These areas reflect especially suitable conditions of soil and topography. Among these districts the following should be noted: (1) The inner portion of the Atlantic Coastal Plain. This district, which extends from Virginia to Alabama, is characterized by gently rolling topography and by well-drained but comparatively light sandy loam soils. It is separated by a relatively unproductive sand-hill strip from (2) the Piedmont Plateau. The cotton lands of the Piedmont are more hilly and their soils, derived from crystalline rocks, are mainly red clays and clay loams. In both of these eastern districts application of commercial fertilizer is necessary to secure satisfactory yields. (3) The Black Prairies of Alabama and Mississippi consist of a crescent-shaped belt of dark-colored fertile clay soils of flat or gently rolling topography. (4) The Mississippi River bluffs and bottom lands. The cotton lands of the bluffs have mainly loess soils, while on the river bottoms alluvial soils predominate. (5) The "black waxy" prairies of Texas. These lands are flat and have dark fertile clay soils. In 1926 North Carolina applied fertilizers to 97 per cent of its cotton land, while in Texas only 7 per cent was fertilized.

Several other districts of smaller size where cotton growing is intensive are to be seen in Fig. 47. Some of these are the valleys of the Tennessee and Arkansas rivers, the red prairies of western Oklahoma and central Texas, and the irrigated cotton lands of southern California and Arizona.

Classes of Cotton.—There are many varieties of cotton grown in the United States but all may be grouped into four classes: (1) *Upland short staple* is much the most abundant class; it comprises more than 90 per cent of the average crop, and is grown in all parts of the cotton belt. The fiber of short staple cotton is white, strong, of medium fineness, and averages about 1 inch in length. (2) *Upland long staple* differs from the foregoing principally in the length of its fiber, which averages 1¼ inches. Both are used for all ordinary fabrics but the longer fiber of the latter brings a higher price. It is grown throughout the cotton belt in small quantities, but principally on the Mississippi River bottom lands. (3) *Sea Island cotton* has a long fiber (1½ to 2 inches) and is very fine and silky. Formerly it was in great demand for the manufacture of fine threads, and for the strong cords required in automobile tires. It was introduced from the West Indies and was grown for many years on the islands fringing the coast of South Carolina and Georgia, hence its name. Later north-central Florida and southern Georgia became the center of Sea Island cotton growing. The crop was expensive to produce and did not, at its best, constitute more than 1 per cent of all American cotton. In 1916 the appearance of the boll weevil in the Sea Island cotton district marked the beginning of a disaster which was complete in 1920. (4) *Egyptian cotton* is now an important crop on the irrigated lands of the Salt River Valley, Arizona, and the Imperial Valley of California and Mexico. Egyptian cotton has a long fiber and is used for many of the same purposes for which Sea Island cotton is desired.

Economic Factors in Cotton Growing.—Cotton is a peculiarly important crop in southern United States. There are no other large areas of the world where cotton can be grown so well, a fact which has led to intense specialization. In parts of the cotton belt one-half, and in some

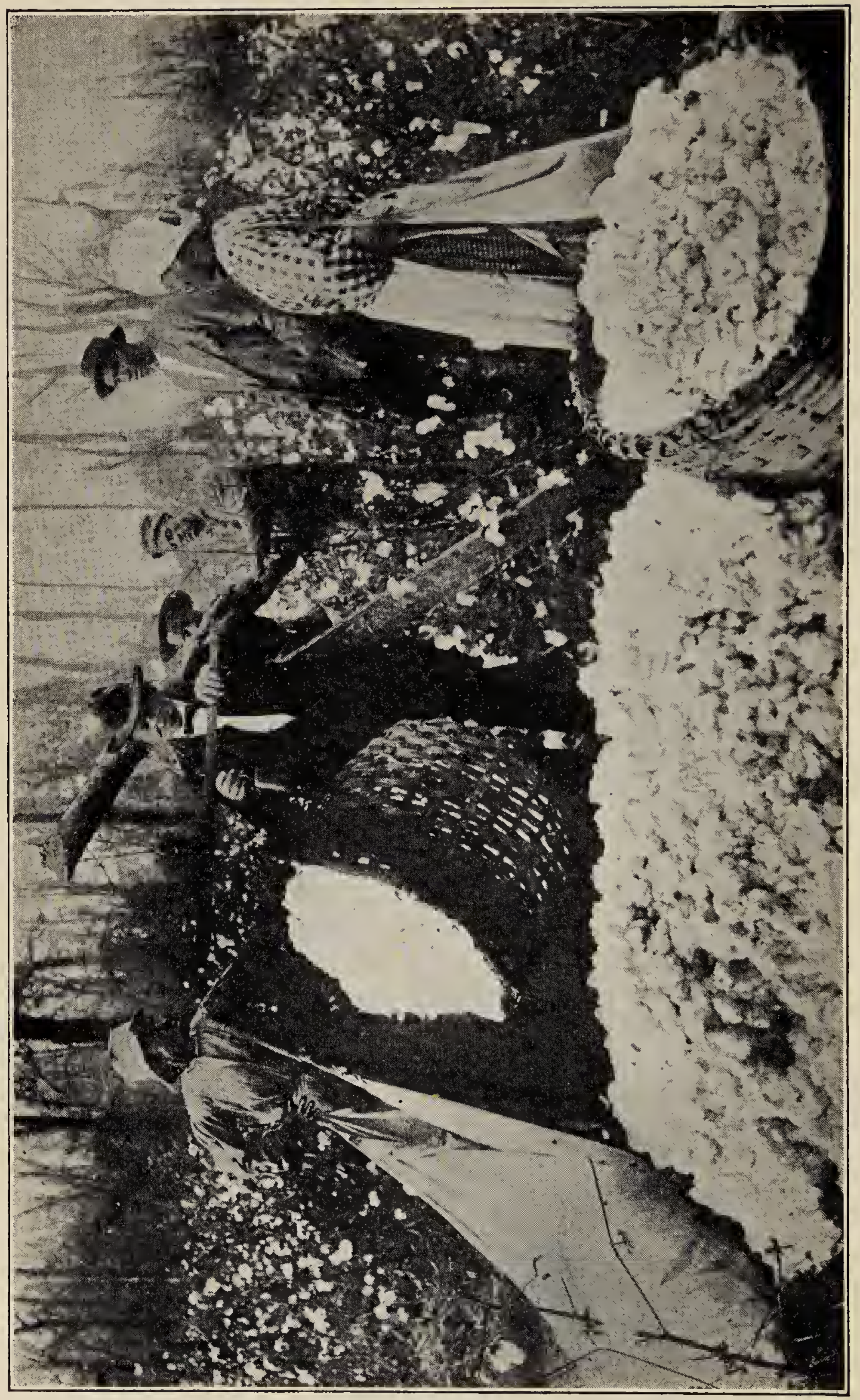


FIG. 48.—A planter weighing cotton picked by his hired hands. (*U. S. Dept. Agr.*)

localities as much as three-fourths, of the cultivated land is planted annually to this one crop. Cotton, like wheat, is a cash crop. Little of it is retained for use on the farm. While both the yield and the price of cotton fluctuate greatly, it contributes annually to the growers more than a billion dollars and has exceeded 2 billions.

So specialized a form of agriculture gives rise to economic conditions very different from those found in regions of general farming. (1) Crops other than cotton are not intensively cultivated. Corn is the crop of next importance, and other cereals as well as many fruits and vegetables are grown, yet the total amount of food produced is often insufficient for the needs of the people of the intensive cotton districts. The deficiency is made up by importing goods from the northern states. (2) The scarcity of hay and grain crops causes the animal industries to be less important than in the North. The absence of animal manures makes it necessary for the planters to spend large sums of money for commercial fertilizers in order to maintain the fertility of the poorer cotton soils (Fig. 121). (3) The abolition of slavery left many plantations without sufficient labor; many of them have been broken up into small farms, but many still remain under the management of a single owner. The small farms are generally cultivated by white or negro tenants who share the crop with the owner or pay cash rent for the land. (4) The nature of the cotton plant and the irregular way in which its bolls ripen, have, so far, made picking by machinery difficult. For cotton picking

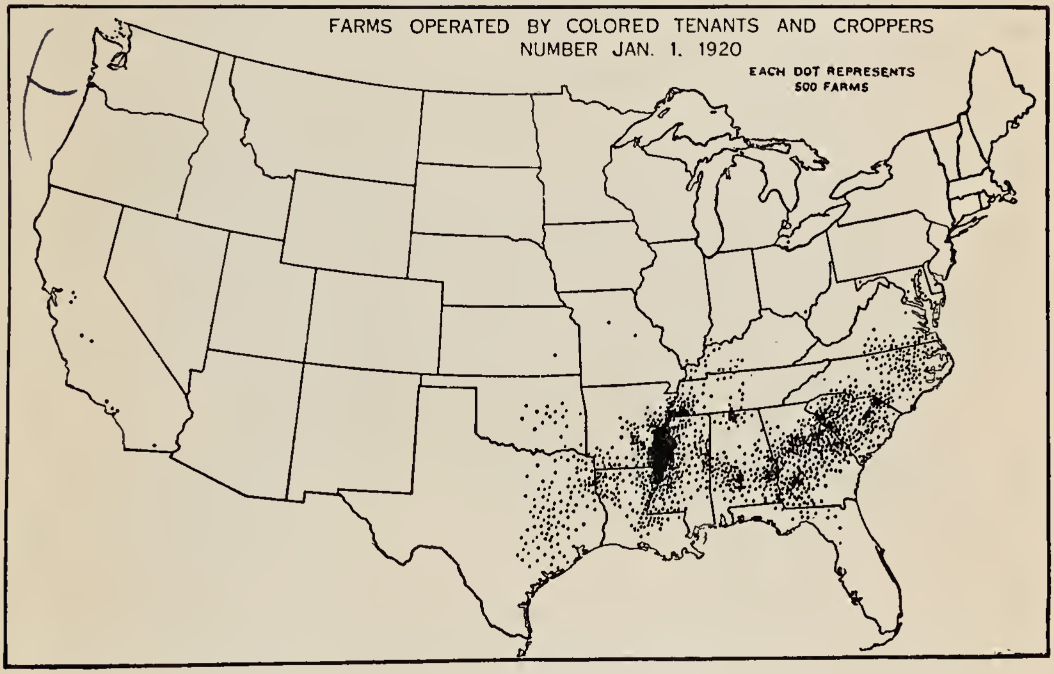


Fig. 49.—The importance of negro labor in the eastern part of the cotton belt is shown by comparing this map with Fig. 47. (*U. S. Dept. Agr.*)

cheap labor is necessary. The 500 pounds of ginned cotton in one bale represents about 10 days' work for an average cotton picker (Fig. 48). Often it requires the entire family of a tenant to pick the cotton which he has been able to plant and tend. Where extra labor at picking time is hard to get, the quantity of cotton per farm may be limited to the amount the family can pick, perhaps 10 or 12 acres. The labor requirement of cotton was the principal reason for the maintenance of slavery in the southern states, and cotton growing is now the principal occupation of the negro population (Fig. 49). (5) Since cotton can be neither eaten nor worn by the farmer, he must sell it for cash with which to buy food and clothing. Even a partial failure of the cotton crop may necessitate mortgaging next year's crop for funds. In general, the cotton growers operate upon a basis of credit to a greater extent than do most other American farmers. This condition has, in the past, led banks to discourage the introduction of other crops or of forms of animal industry which would not be likely to yield an immediate cash return with which debts could be paid. The unwisdom of this policy is now widely recognized and banks are foremost in the encouragement of diversified agriculture in the cotton belt.

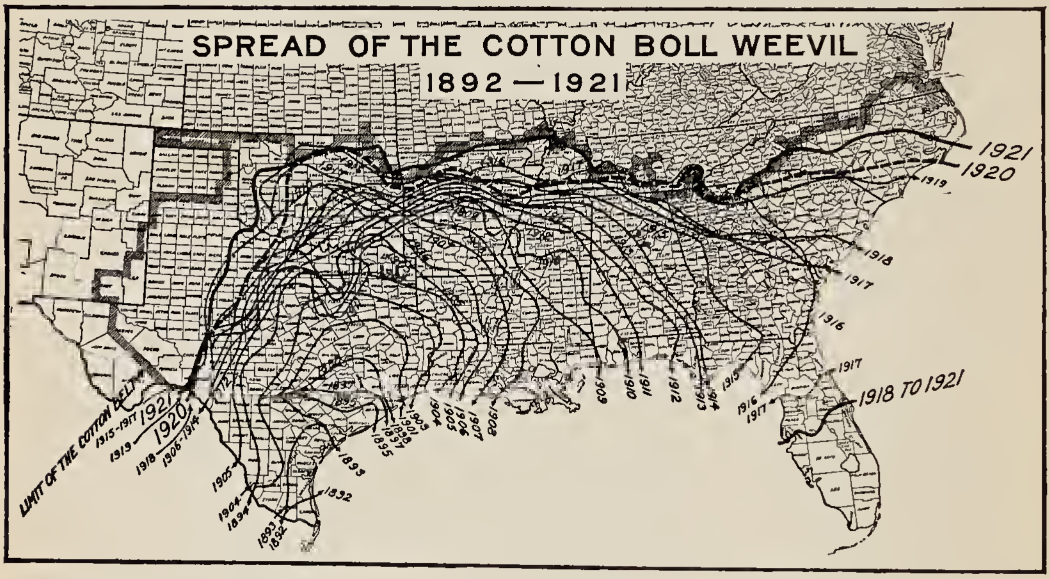

SPREAD OF THE COTTON BOLL WEEVIL
1892 — 1921
1921
1920
1919
1918
1917
1916
1917
1918 TO 1921
LIMIT OF THE COTTON BELT
1915-1917
1921
1920
1919
1918
1906-1914
1905
1904
1894
1893
1892
1893
1895
1909
1910
1911
1912
1913
1914
1915
1916
1917

Fig. 50.—The boll-weevil has now spread to nearly all parts of the cotton belt. (*U. S. Dept. Agr.*)

The Influence of Cotton Pests.—Cotton is subject to the ravages of several diseases and pests. The most important and destructive of these pests is the boll weevil, which entered southern Texas from Mexico in 1892. The weevil is the larva of a beetle. The eggs of the insect are laid through perforations made in the covering of the young cotton boll and the growing larvae feed upon the immature fiber. Year after year the pest has spread north and east until, in 1921, it reached North

Carolina and all of the principal cotton districts were then affected (Fig. 50). The first appearance of the weevil often brought crop failure and financial disaster. One of the most severe blows to cotton growing which has resulted from the work of the boll weevil was felt when the Sea Island cotton district of Georgia and Florida was finally reached. The crop of Sea Island cotton in 1916 amounted to about 117,000 bales, while that of 1920 was less than 2,000 bales. In 1921 it was estimated that one-third of the total prospective cotton crop of that year was destroyed by the boll weevil. Fortunately, not all districts are equally afflicted, nor is the damage in all years uniformly great. Cold winters and dry springs are harmful to the weevil. For that reason the western cotton fields of Texas suffer less than others, and in some years other sections of the cotton belt are comparatively free from damage. It is also true that familiarity with the ways of the pest has taught means of control by the introduction of more careful and varied methods of agriculture and by the selection of quick-maturing varieties of cotton. Although the weevil takes a large annual toll from the cotton planters, it is not so large as to be generally disastrous. Indeed, by some, the weevil has been pronounced a blessing in disguise, since it has enforced more careful farming and the partial abandonment of the one-crop system in favor of a more diversified type of agriculture in the cotton belt.

Note

COTTON MARKETING

Preparation for Market.—About two-thirds of the weight of freshly picked cotton is in the seeds. The preparation of cotton for market begins with the removal of the seeds at a local ginnery. Different sections of the cotton belt employ different methods of ginning and different types of machines. Saw gins are most common in the upland cotton districts while the long fibers of Sea Island and Egyptian cottons are preserved only by the use of the slower roll gin. At the ginnery the fiber is pressed into rather loose burlap-covered bales which average about 500 pounds in weight. The farmer pays for the service and removes his cotton and its seed to await a favorable opportunity to sell.

The Cotton Warehouse.—The baled cotton is commonly stored in public warehouses where it is protected from damage. The warehouse receipt delivered to the owner is good security for a bank loan which may carry him until the cotton is sold. The warehouse also serves as a convenient place for grading cotton into lots of uniform quality. The grading is now done largely upon a basis of standards determined by the United States Department of Agriculture.

Cotton Markets.—Cotton is sold by the grower to a buyer who may be a local merchant or who may represent a middleman or even a distant mill. Farmers with only one or two bales of cotton commonly sell immediately after the cotton is ginned, usually to local merchants. Yet,

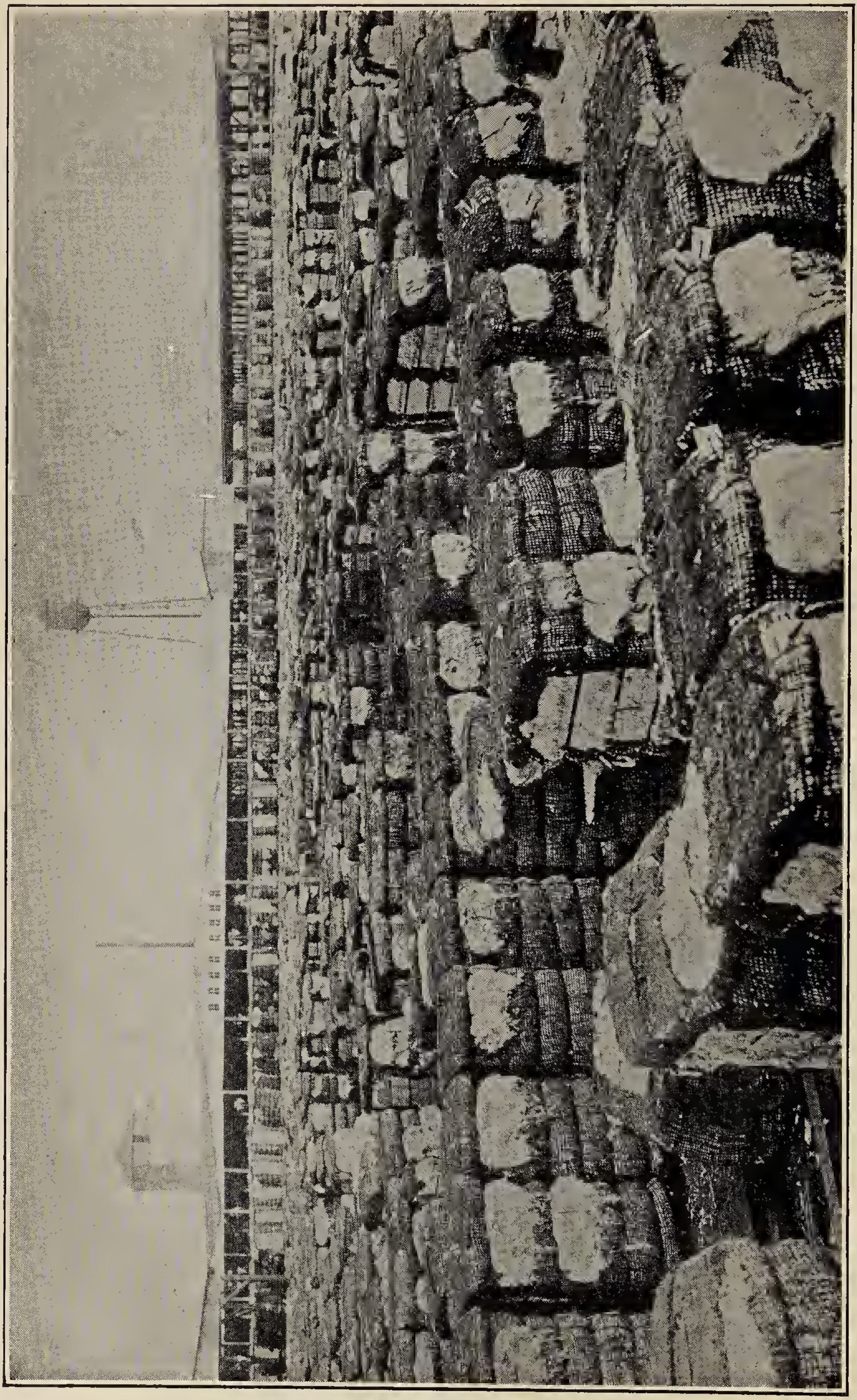


FIG. 51.—Cotton on its way to market. Part of 12,800 bales in the sheds and yards of a southern compress company. (*U. S. Dept. Agr.*)

whether the bale is a part of a large or of a small lot, it eventually finds its way with many others from the primary market into a central market. (1) The central market may be one of the larger cities of the cotton belt where the grading is completed and, if the cotton is destined for export, the bale is further compressed to save shipping space (Fig. 51). (2) It may be an export market in a coast city, such as Galveston, New Orleans, or Savannah where the bale may be sold for overseas shipment. Or (3) it

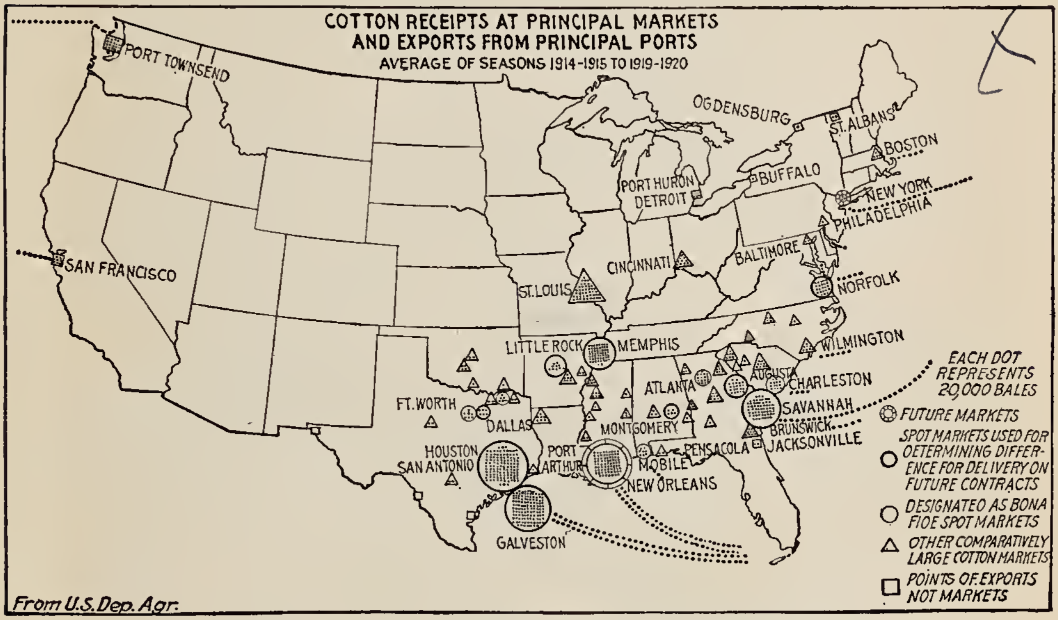
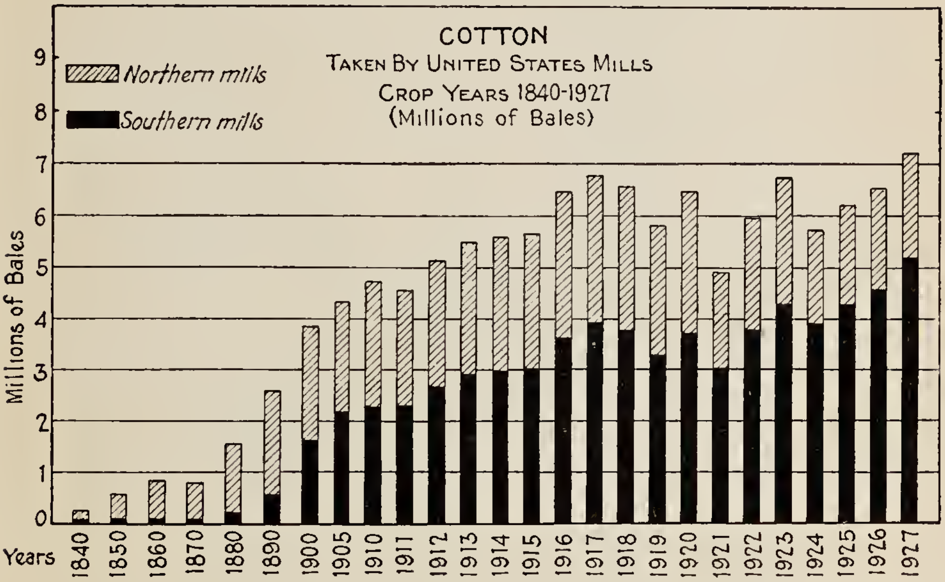

COTTON RECEIPTS AT PRINCIPAL MARKETS
AND EXPORTS FROM PRINCIPAL PORTS
AVERAGE OF SEASONS 1914-1915 TO 1919-1920
PORT TOWNSEND
SAN FRANCISCO
OGDENSBURG
ST. ALBANS
BOSTON
BUFFALO
NEW YORK
PHILADELPHIA
PORT HURON
DETROIT
BALTIMORE
CINCINNATI
NORFOLK
ST. LOUIS
WILMINGTON
LITTLE ROCK
MEMPHIS
ATLANTA
AUGUSTA
CHARLESTON
SAVANNAH
BRUNSWICK
JACKSONVILLE
FT. WORTH
DALLAS
MONTGOMERY
PENSACOLA
HOUSTON
SAN ANTONIO
PORT ARTHUR
MOBILE
NEW ORLEANS
GALVESTON
EACH DOT REPRESENTS 20,000 BALES
FUTURE MARKETS
SPOT MARKETS USED FOR DETERMINING DIFFERENCE FOR DELIVERY ON FUTURE CONTRACTS
DESIGNATED AS BONA FIDE SPOT MARKETS
OTHER COMPARATIVELY LARGE COTTON MARKETS
POINTS OF EXPORTS NOT MARKETS
From U.S. Dep. Agr.

Fig. 52.—The principal cotton markets and cotton ports of the United States.

Study



X

Fig. 53.—United States cotton mills have nearly trebled their output since 1890.

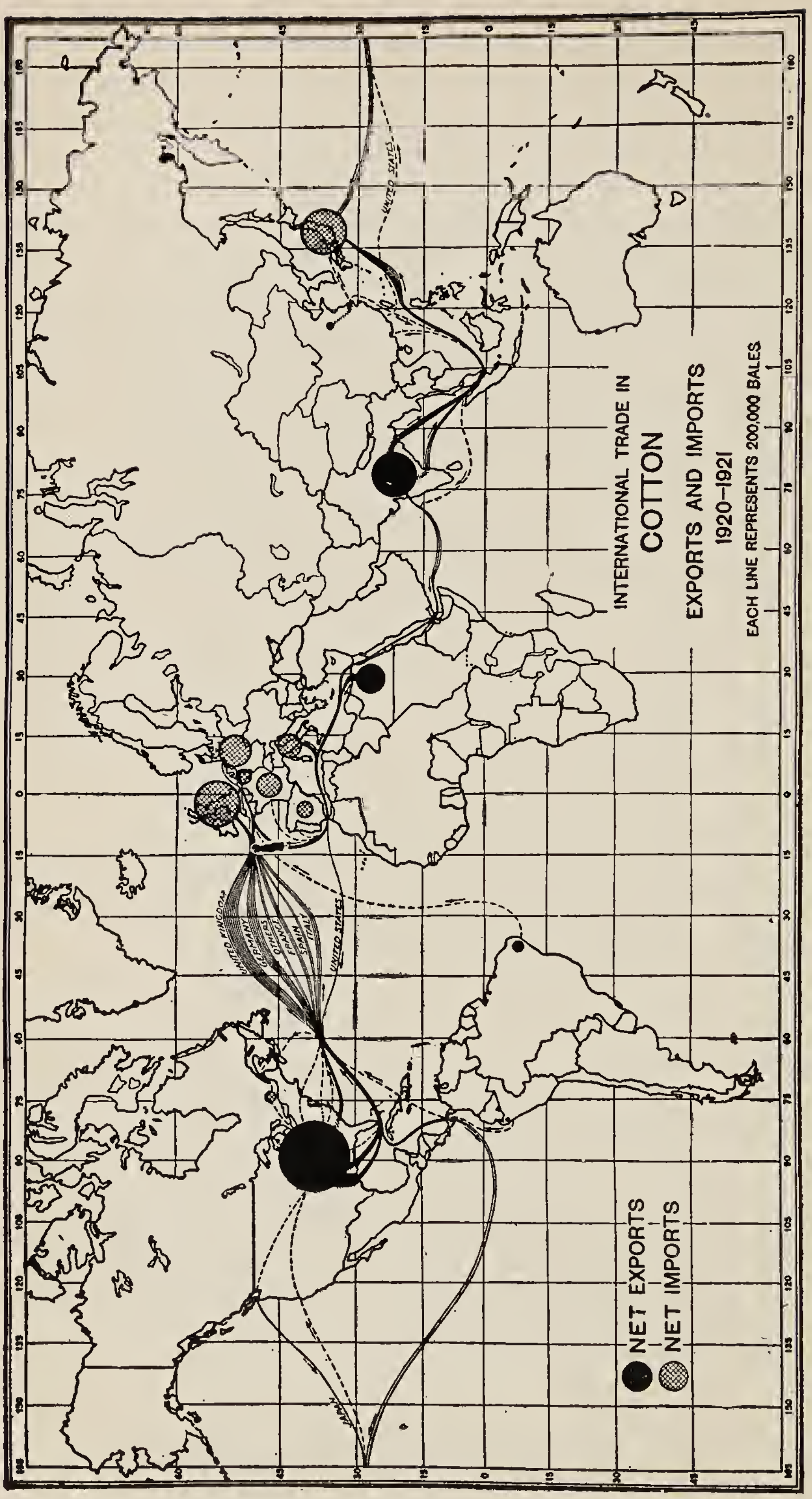

INTERNATIONAL TRADE IN
COTTON
EXPORTS AND IMPORTS
1920–1921
EACH LINE REPRESENTS 200,000 BALES
NET EXPORTS
NET IMPORTS
UNITED KINGDOM
GERMANY
OTHERS
FRANCE
SPAIN
ITALY
UNITED STATES
UNITED STATES
JAPAN

Fig. 54.—The principal international trade in raw cotton crosses the Atlantic between the United States and the industrial countries of northwestern Europe. (*U. S. Dept. Agr.*)

may be a consuming market in which is located the cotton mill which will manufacture the bale of raw cotton into a fabric (Fig. 52). The cotton markets known as "future" markets are important because of their cotton exchange dealings and their influence upon cotton prices rather than because of the number of bales of cotton actually handled in them. New York and New Orleans are the cotton "future" markets of the United States, but Liverpool, England, is the principal cotton exchange center of the world.

American Foreign Trade in Cotton.—Before the World War more than one-half of the average American cotton crop was shipped to foreign markets. This was true of no other important farm product. The proportion of the crop manufactured in America has increased since the early days of the industry (Fig. 53). Cotton shipments constitute a large part of the business of railways in the cotton belt and of several of the ports along its margin. Galveston is the most important point of export, yet New Orleans and Savannah also have large shares in this trade which is directed mainly toward the ports of northwestern Europe (Fig. 54). Not a little cotton makes a long coastwise trip or rail journey overland and is exported from New York, Boston, San Francisco, and Seattle.

Note

COTTON MANUFACTURING

The Importance of Cotton Textiles.—The manufacture of cotton cloth is not native to America or even to Europe. The exhaustless patience and cheap labor of the Orient enabled the people of China and India to separate the fiber from the seed of native cotton, and to spin and weave cotton fabrics, all by the simplest of hand apparatus, long before such an industry was thought of in the western world. The Coromandel Coast of India was particularly famed for the fineness of its fabrics. Although little of the best was ever exported, cotton cloths obtained by European and American traders from the Indian port of Calicut were in great demand. They were known to the trade as "calicos."

Cotton cloth has been abundant and in general use in Europe and America for little more than a century. Cheap cotton in America was followed by the development of factory spinning and weaving in England. This combination made cotton fabrics so inexpensive that in many parts of the world the household manufacture of linen and woolen clothing was given up and the arts of home spinning and weaving were forgotten. Cotton now enters not only into clothing but also into such an infinite variety of other essential commodities that sudden disaster to the crop would enforce world-wide privation and suffering before any readjustment could be made.

Types of Cotton Mills.—The most important type of cotton manufacturing establishment is the mill which spins and weaves raw cotton into piece goods. Such cloths are of great variety, ranging from canvas or blankets to the finest lawns and organdies. Other types of establishments turn out knit goods, chiefly hosiery and underwear; cotton small wares, from laces to lampwicks; bags, yarns, threads, and twine.

The Distribution of American Cotton Mills.—Cotton manufacture in America clings to the Atlantic seaboard states (Fig. 55). Some mills have sprung up in the middle western states and some in the cotton-growing districts west of the Mississippi River. Relatively, however, they are few in number and the total value of their products is small.

The mills of eastern North America are distributed from Quebec to Alabama, and may conveniently be divided into three important groups: (1) New England, (2) the Middle Atlantic states, and (3) the South. The cotton industries of the three differ in many important respects.

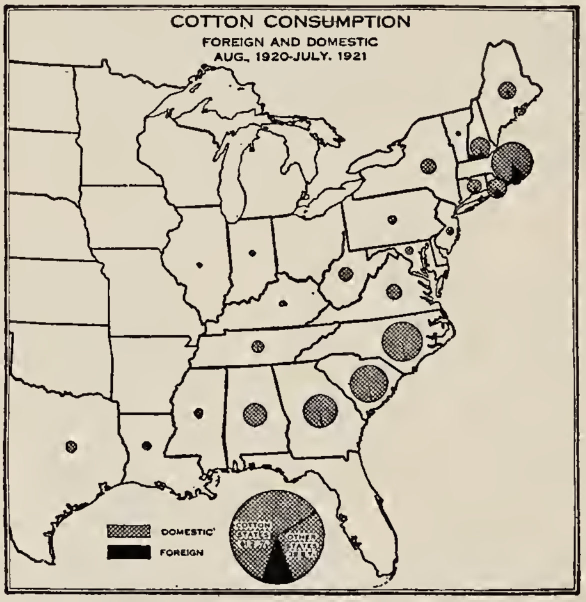


Fig. 55.—The mills of the cotton states use more cotton than those of the North, but the latter use finer cotton, including most of the imported fiber. (*U. S. Dept. Agr.*)

Cotton Manufacturing in New England.—The manufacture of cotton began in New England at the close of the American Revolutionary War. For some years the industry made little progress, due to scarcity of labor and of capital and to the strength of British competition. The first quarter of the nineteenth century saw (1) the accumulation of considerable capital in New England through the shipping and fishing industries, (2) a greatly increased supply of raw cotton available in the South, and (3) the introduction of the power loom and other mechanical improvements in spinning and weaving. These inventions permitted the utilization of some of the abundant water powers of New England in cotton manufacture and thereby reduced the cost of human labor, an important factor in the competition with goods made in England. The impetus furnished by these new conditions caused cotton mills to spring up in many parts of New England but especially in the southeastern section.

The character of present-day cotton manufacturing in New England reflects conditions of economic pressure as well as of environment. Competition from mills located in the southern states has enforced the economies which come from concentration and specialization. Many small mills have been abandoned, while those best situated have greatly increased their capacities. Although water power still furnishes the primary motive power of many mills, it has ceased to be a controlling factor in the location of cotton manufacturing. Coal has taken its place. The great enlargement of the mills in New Bedford, Fall River, and Taunton, Mass., and in Pawtuckett, Warwick, and Cumberland, R. I., during recent decades is, in part, a response to cheaper freight rates on coal than can be had at points in the interior of New England. The rapidly increasing use of hydroelectric power may, in the future, decrease this present advantage of position. Southeastern New England has also the advantage of more uniform conditions of climate. In spite of artificial means for controlling temperature and moisture in cotton mills a naturally humid atmosphere is still a factor of some importance in the manufacture of fine cotton goods. In this small southern New England district, including Rhode Island and adjacent parts of Massachusetts and Connecticut, are more than one-third of the cotton spindles of the United States. Other important cotton manufacturing towns are Lowell and Lawrence, Mass.; Manchester and Nashua, N. H.; Saco and Lewiston, Me.

The labor employed in the New England cotton mills is composed only in small part of early American stock. The skilled employees are drawn from families of French Canadian or European origin, many of whom entered this employment two or three generations ago. The common labor is performed by more recent immigrants.

Nearly all classes of cotton goods are manufactured in New England, yet greater attention is given, than in the South, to the weaving of fine fabrics, and most of the fine raw cotton imported from Egypt is used in New England mills (Fig. 55). This is the economic result of more skilled and expensive labor and of the more efficient factory management which concentration and large capital have brought about. Fine goods also require less raw cotton than coarse in proportion to the value of the finished product, and the higher transportation charges on cotton from the distant cotton fields can be absorbed in the higher selling price of these fine goods.

Cotton Manufacturing in the Middle Atlantic States.—Philadelphia is the center of a cotton manufacturing district which lies midway between those of New England and the South. It has, in general, smaller mills and is of less importance than either of the others. The industry in this section is characterized more by its knitting mills than by the weaving of cloth. Although wool and silk are also used in the knitting industries, cotton constitutes more than half of the raw materials used in hosiery manufacture and most of that used in underwear.

Knitting mills were established at Germantown, near Philadelphia, at an early date, and Philadelphia with other cities (Reading and Shamokin) in eastern Pennsylvania, continues to be a very important center of this industry. Knitting mills are, however, much more widely scattered in North America than are weaving mills. Important knitting industries have grown up in the South, in the Mohawk Valley of New York, and in or near Chicago, as well as scattered mills in many other places. The factors which have helped to develop the knitting centers are (1) an early start and a reputation for excellent products, as at Germantown and Cohoes, and (2) an abundant supply of cheap, unskilled labor. In the South, native labor is employed, but elsewhere immigrant girls constitute the chief supply.

Cotton Manufacturing in the South.—Cotton manufacturing has developed rapidly in the southern states. In 1928 more than twice as much raw cotton was used in the southern mills as in those of New England. This development may be attributed to several factors. (1) Nearness to supplies of raw cotton was an important factor in establishing many southern mills. It is still an important factor where the region adjacent to the mill supplies enough raw material to satisfy the demand, but in many southern towns the industry has outgrown the local supply of cotton. Mills so located find it necessary to import a part of their raw material from distant parts of the cotton belt and their freight charges are not materially less than those of New England mills. (2) Cheap water power developed at the "fall line" and in the Southern Appalachians is an added attraction to cotton manufacturers, although nearly half the power used in southern cotton mills is generated by coal, which, however, is as accessible from southern mills as it is from those of the North. (3) Probably the most important attraction in the South has been an abundant supply of competent but cheap white labor and relative freedom from the domination of labors unions.

As a result of these and other factors the type of cotton manufacturing in the South differs in several ways from that found in New England. (1) The mills are numerous, and though most of them are modern and well equipped, they average smaller than those of New England, and (2) the goods manufactured, though of great variety, are generally heavier than those made in New England mills, requiring more cotton and less skill. The average annual quantity of raw cotton spun in Massachusetts is 56 pounds per spindle, in North Carolina it is 109 pounds, and in Georgia 149 pounds per spindle.

The Dyeing and Finishing of Textiles.—Newly spun cotton yarn is gray in color and contains impurities. Before it can be marketed as cloth it must pass through many processes designed to cleanse, bleach, dye, or otherwise improve or change its appearance. The processes are technical and require skilled labor and abundant pure water. Many large New England mills dye and finish at least a part of their own cloths, but in general, dyeing and finishing is a separate industry which deals also with silk and wool. The dyeing and finishing industry is concentrated in the area between Boston and Philadelphia and is not important in the cotton-manufacturing districts of the South. Certain fabrics from these mills are sent north for finishing.

The Manufacture of Cotton Clothing.—The manufacture of clothing from cotton cloth is an essential part of the general clothing industry. The cotton piece goods are obtained from many sources and the market is widespread. The principal influence affecting the location of the industry is the supply of inexpensive labor, and, like other clothing industries, this one is found principally in New York, Philadelphia, and Chicago. In the manufacture of collars, cuffs, and shirts, New York and Pennsylvania predominate. The industry is particularly concentrated in the city of Troy, N. Y., due largely to its early start. These industries employ linen and silk as well as cotton cloth.

American Foreign Trade in Cotton Goods.—The cotton-manufacturing industry of the United States has outgrown its domestic market. In 1880 only 16 per cent of the world's cotton crop was manufactured in America. The proportion now exceeds 27 per cent; yet the United States has less than one-fourth of the cotton-spinning and weaving machinery of the world and employs only one-eighth of the workers in this industry. The conclusion is clear; American mills, as a whole, make plain and relatively heavy goods which require abundant cotton, and a large use of automatic spinning and weaving machinery operated by intelligent and somewhat expensive labor. While there is a large market for such goods in America, the general wealth of the people creates also a large market for the more expensive foreign fabrics.

In a recent year the United States purchased, chiefly from England, Switzerland, and other west European countries, about 62 million yards of cotton cloth, whose average import valuation was 38 cents per yard. In the same year the American mills made sufficient cloth (of somewhat similar character) to supply the domestic market and to export more than 500 million yards. The average export valuation of this cloth was, however, only 15 cents per yard. The largest markets for American cloth are found in Canada, Cuba, and the South American countries. The Philippine Islands and China are also large buyers. Many other items beside cotton cloth enter into the list of America's foreign trade in cotton manufactures.

The Plant-stalk Fibers

Home Grown Fibers Unimportant.—Compared with the cotton crop the plant-stalk fibers grown in North America are unimportant. Both flax and hemp are well adapted to the climatic and soil conditions found in many parts of eastern United States and Canada, but neither is grown in important quantities for fiber, for both require so much human labor in their harvesting and preparation for spinning that it is difficult for the American grown crop to compete in price with foreign flax and hemp, raised where labor is cheap.

Flax.—During the American Civil War cotton was very expensive and flax became a common crop in the northern states. Recently, due to the shortage of flax in Russia, the crop has been encouraged in the Great Lakes region. Machinery is replacing hand labor in handling the crop to an extent which may in the future enable flax for fiber to obtain a place of some importance in American agriculture. The fiber of the flax grown in the northwestern seed-flax district is coarse and brittle and is suited only to the spinning of twine. It is also used in making packing used in refrigerator cars and in the manufacture of insulating board for houses.

Hemp.—Hemp was once extensively grown in the Bluegrass region of Kentucky. The competition of cheap tropical fibers and of cotton in the manufacture of bagging, rope, and twine has caused the decline in relative importance which this crop has suffered. Yet the crop has continued in a small way and its cultivation has also spread to other areas, particularly to Indiana and Wisconsin.

The Manufacture of Plant-stalk Fibers.—The value of the manufactures of plant-stalk fibers in the United States is little more than 10 per cent of that of cotton manufacturers. The products consist of linen piece goods, linen thread, jute bagging, burlap, rope, and twines of all descriptions. Imported raw materials are required for most of these products. Although the industry is widely scattered, New England and the Middle Atlantic states lead, due (1) to the convenience of imported raw materials, (2) to the presence of other textile industries with which these are closely associated, and (3) to the large local market.

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CHAPTER VIII

FORESTS AND FOREST PRODUCT INDUSTRIES

Forest Products Essential.—Among many primitive peoples wood and other forest products serve a wide range of economic needs and are indispensable in their mode of life. The industrial and commercial nations of the world have developed numberless substitutes for wood, but have not thereby decreased their consumption of it or become less dependent upon forest products. New demands have arisen which utilize the products of the forest in a multitude of ways unknown to primitive men. Directly or indirectly every aspect of modern life would be handicapped if the woods, resins, and chemical products of forest trees became scarce or unduly expensive. But little thought is required to bring to mind some of the numerous ways in which these products influence the growing and packing of foods, the manufacture of clothing and of paper, the erection of shelters, the construction of means of transportation and communication, and the making of a wide array of items of less essential nature.

North America is a new land. Most of it is well supplied with rainfall and it originally supported vast forests of a value unequaled in any other continent. This heritage has been freely used; much of it has been wasted; but fortunately a good part of it still remains. Intelligent consideration of the wise use, conservation, and perpetuation of these essential materials is the duty of every person.

Primeval Forest Regions.—The original forests of North America consisted of a broad, northern, transcontinental belt with three unequal southward projections (Fig. 56). The boundaries of these forests were determined mainly by conditions of climate, topography, and soil. Although parts of these forests have disappeared, the remaining portions constitute the timber-producing districts of the continent.

The northern margin of the forested region extends from central Labrador westward to Hudson Bay, on the west side of which it inclines northward to the mouth of the Mackenzie River, and across Alaska. North of this irregular line the warm season is so short and soil moisture is so permanently locked up by frost that valuable trees cannot grow. N.B. The transcontinental forest zone is most valuable north of the Great Lakes region. Its three southward projections are (1) the forests of the Pacific slope, (2) the Rocky Mountain forests, and (3) the broad eastern forest region extending from Lake Superior and the Gulf of St. Lawrence southward to the Gulf of Mexico. These three unequal forest regions are separated from one another by (1) the broad dry stretches of the cordilleran plateaus, and (2) by the grassy expanses of the central plains.

Types of Original Forest.—The forests of North America contain a great variety of valuable trees. Although many species are, by conditions of temperature and rainfall, limited to small parts of the continent, so great is the number of species that nearly every locality has a considerable variety. Yet each of the principal forest regions is characterized by a group of species which have determined the main uses to which the wood is put. The northern forest belt of Canada is predominantly a region of spruce, fir, birch, and poplar. The eastern forests (3 above) include three dissimilar subdivisions: (*a*) a northern section, dominated by the white pine and the hemlock, and a peninsular projection of this section which follows the Appalachian Mountains southward; (*b*) a central hardwood region in which oak, maple, and hickory are a few of the abundant and valuable species; and (*c*) a southern section, in which

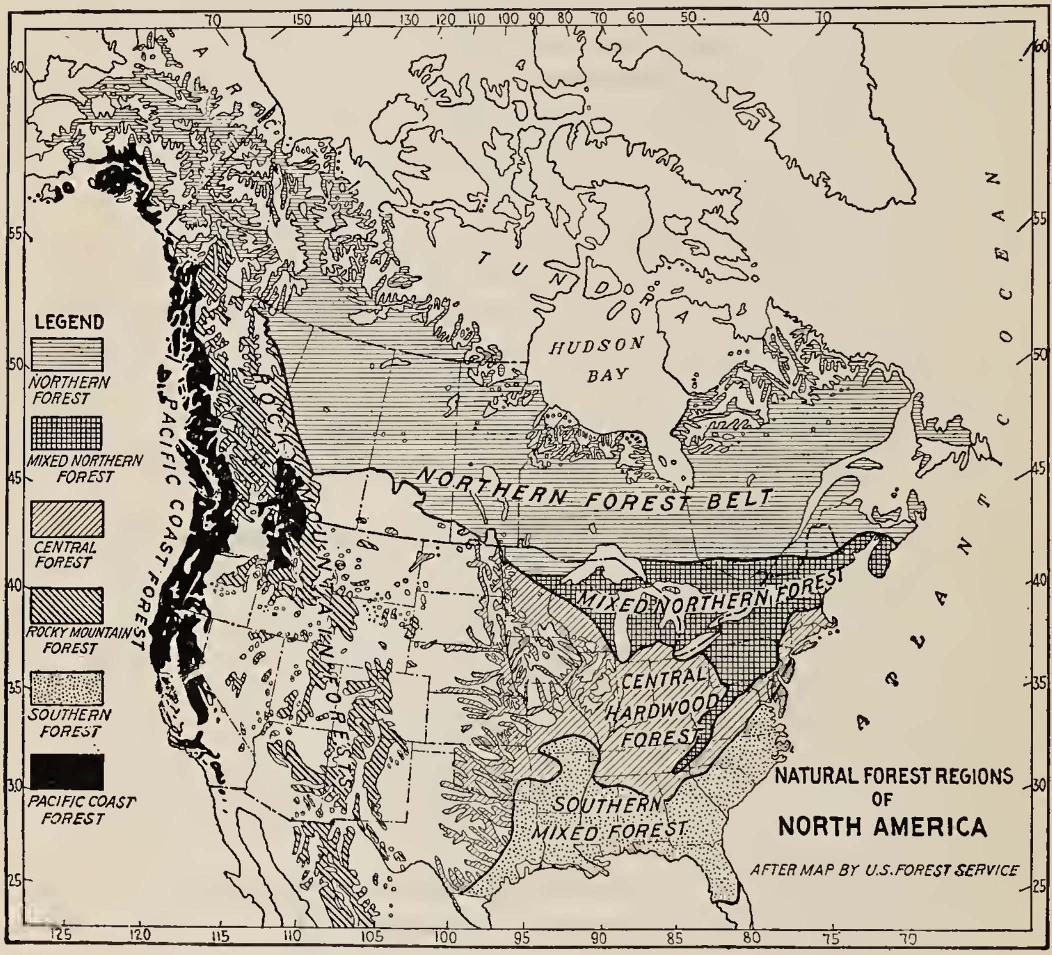
LEGEND
▤ NORTHERN FOREST
▦ MIXED NORTHERN FOREST
▨ CENTRAL FOREST
▧ ROCKY MOUNTAIN FOREST
░ SOUTHERN FOREST
■ PACIFIC COAST FOREST
TUNDRA
HUDSON BAY
ATLANTIC OCEAN
PACIFIC COAST FOREST
ROCKY MOUNTAIN FORESTS
NORTHERN FOREST BELT
MIXED NORTHERN FOREST
CENTRAL HARDWOOD FOREST
SOUTHERN MIXED FOREST
NATURAL FOREST REGIONS OF NORTH AMERICA
AFTER MAP BY U.S. FOREST SERVICE

Fig. 56.—The original forest regions of North America.

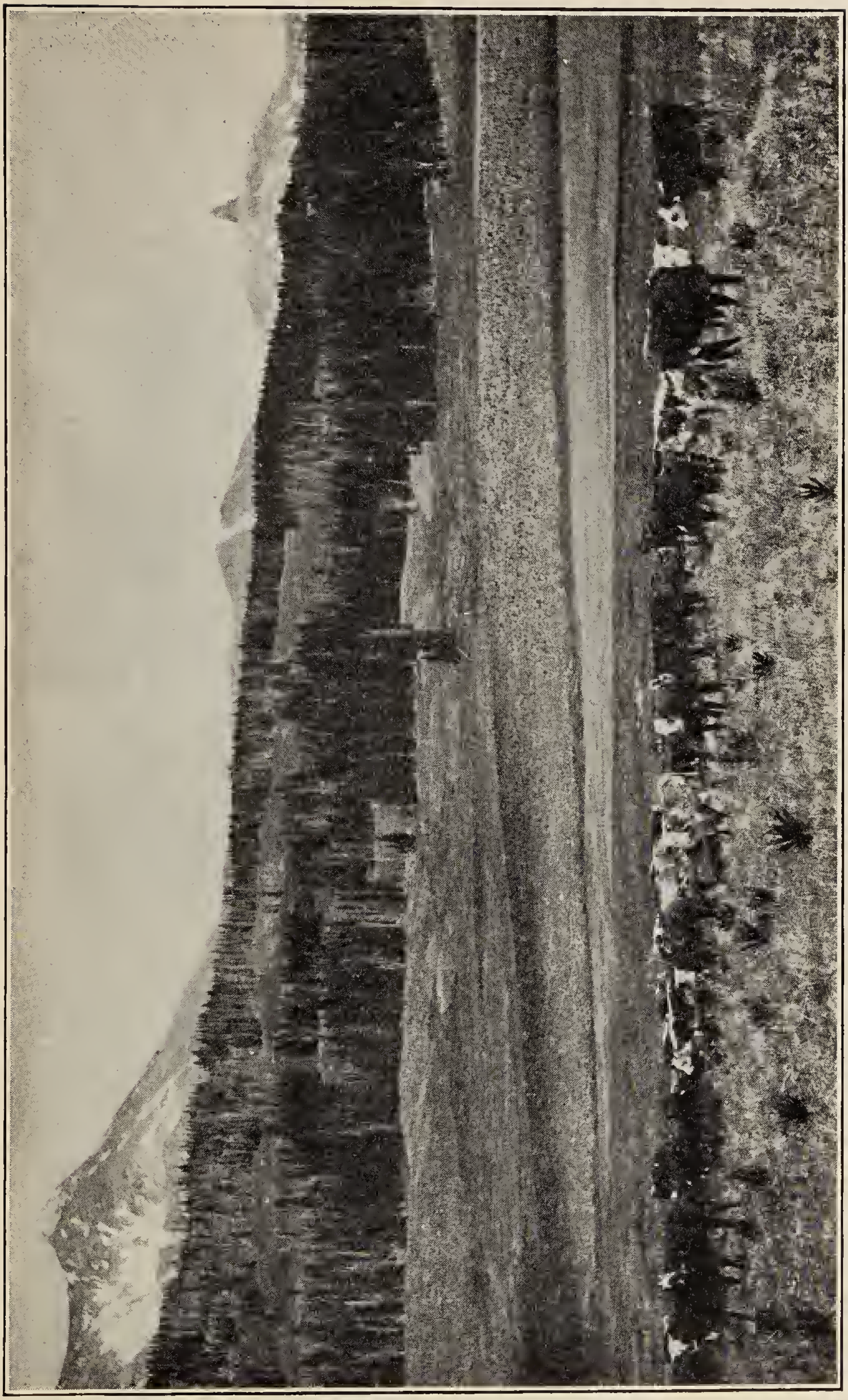

Fig. 57.—The open timber of the Rocky Mountain forests. The mountain valleys and intermediate slopes furnish grazing for cattle and sheep. (*Photo by U. S. Forest Service*).

different kinds of pine again give the principal character to the forest. Except on the prairie margin, these forests were originally dense and in places almost impenetrable.

The western mountain forests are made up almost wholly of coniferous trees of many kinds, of which the Douglas fir is one of the most valuable. Except on the northern Pacific Coast, where the rainfall is heavy, the mountain forests are much more open and scattered than were those of the East (Fig. 57). The splendid forests of Douglas fir and of pine found in northern California and in western Oregon, Washington, and British Columbia are among the most valuable forests in the world (Fig. 58).

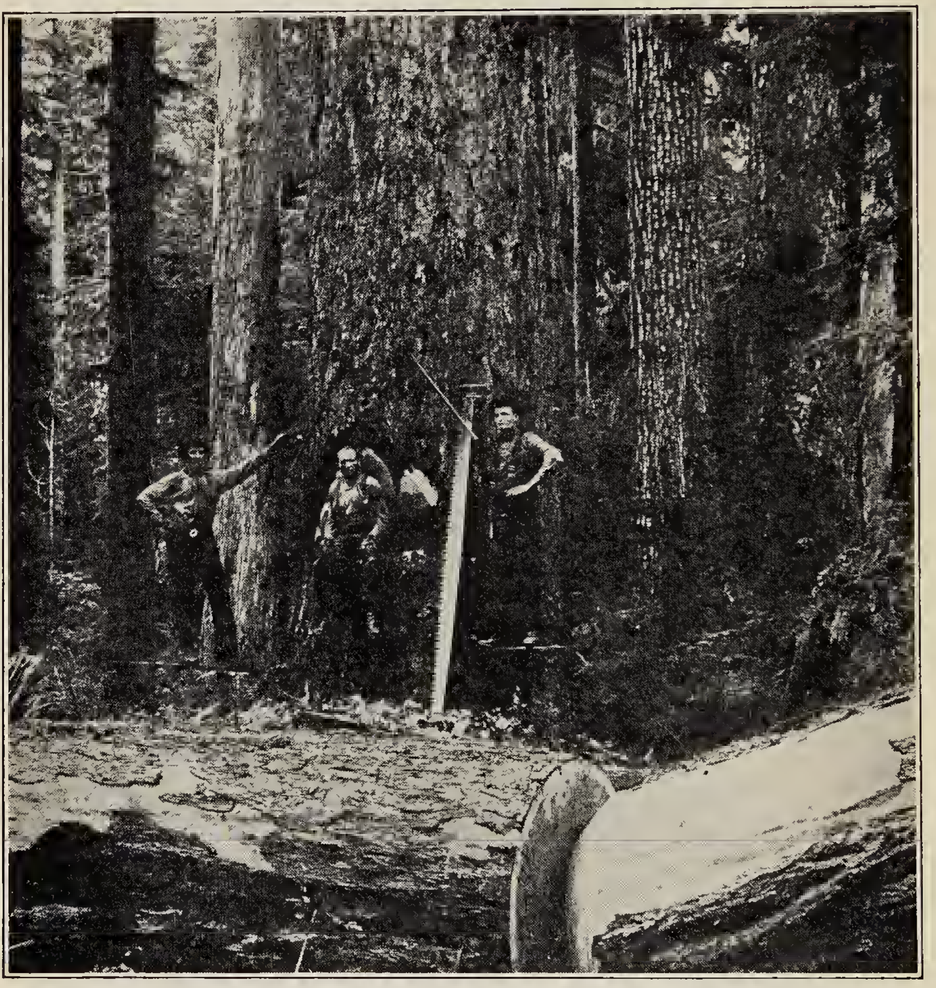

Fig. 58.—The dense stand of Douglas fir and cedar in a forest on the rainy Pacific Coast. Contrast with Fig. 57. (*Photo by U. S. Forest Service*).

The Present Forest Situation.—The original forests of the United States covered 822 million acres,[1] or more than 40 per cent of the total area of the country. The destruction of these virgin forests has proceeded with great rapidity. Settlement in the forested states involved the clearing of forest to make room for agriculture. Moreover, competitive conditions in the lumbering industry and the very abundance and cheapness of wood encouraged the practice of destructive lumbering and the use of only the best timber. Such conditions were not particularly to be deplored, except where land unsuited to agriculture was stripped of its forest, for the rate of growth was, until recently, even more rapid than the rate of consumption. That happy state has, however, passed, and of the original area of virgin forest only about 16 per cent now remains and that mainly in the least accessible places (Fig. 59). Twenty-three

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[1] Toumey, J. W. The present situation of forestry with special reference to state forestry, *Science*, n. s., vol. 54, p. 561.

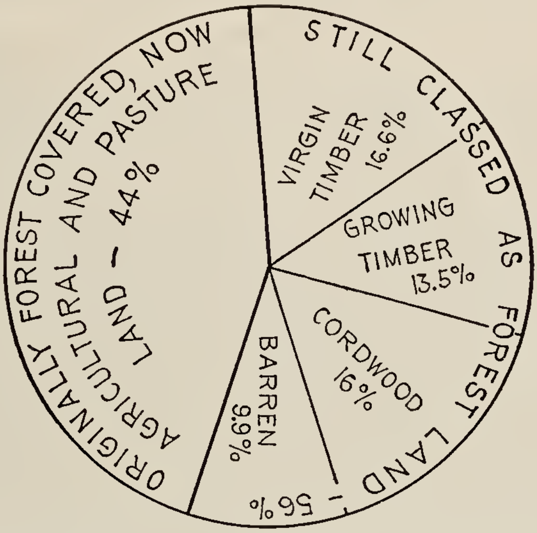


FIG. 59.—The present condition of the 822 million acres of original forest land in the United States.

per cent of the area of the United States is still classed as timber land, but less than one-third of this area is still in virgin timber; about half of it is burned-over and cut-over land which now bears an irregular growth often of undesirable species, while one-sixth of the total is idle land, entirely devoid of timber. Unfortunately, many of these lands, naturally unsuited to agriculture, have been so damaged by fire and erosion that forests will again find footing but slowly if at all (Fig. 60). So great is the present forest depletion that the annual rate of cutting for lumber, combined with destruction by fire and other losses, is more than four times as great as the quantity added by the annual growth of new timber. At that rate of destruction the small remnant of this vast heritage cannot last long. Note

American Forest Conservation.—The problem of insuring adequate forest resources for the future has long been urged upon the people of America by the advocates of conservation. The problem is very complex and no generally satisfactory solution is in sight. In spite of a general appreciation of the approaching timber shortage, destructive methods of lumbering and devastating fires continue to deplete the forests and little is done to replace the loss. Various factors contribute to this condition, but perhaps the most important is a serious and long-standing conflict between public and private interests. It is obviously to the public interest that economical and selective methods of lumbering should be practiced; that cut-over lands which are not valuable for agriculture should be reforested; and that efficient patrols should be established in all forest regions to reduce losses from fire. On the other hand, lumbering has always been intensively competitive, a condition which, together with high freight charges, has kept the lumberman's margin of profit low.

not

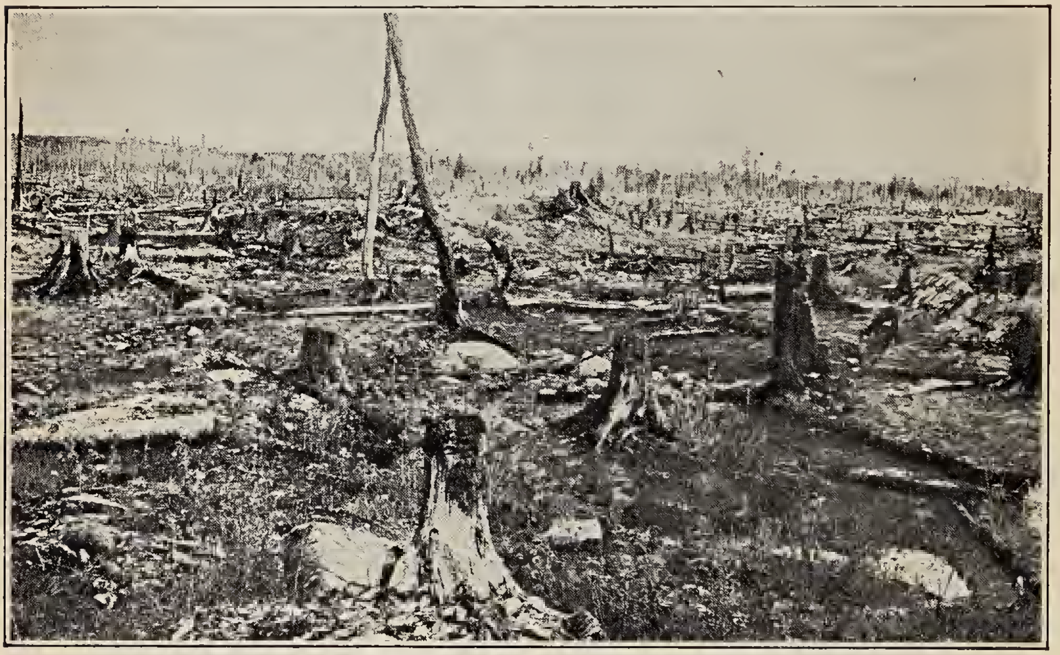


Fig. 60.—The desolation that has followed lumbering and fire in Minnesota. Much of this kind of land is included in the area classified as forest. (*Photo by U. S. Forest Service.*)

He has, therefore, not generally been able to practice economical lumbering or to establish fire patrols. Existing methods of taxation upon timber lands have also made the cost of holding them so great that the lumberman could not afford the slow practices of selective cutting of timber but has had to strip his land as quickly as possible. He does not set about reforesting his cut-over lands because his business judgment tells him that, in consideration of the long wait for returns and the many risks involved, the investment is a poor one. It is clear that in this conflict of interests, public welfare demands that government shall plan for the future, since private enterprise finds it unprofitable to do so.

National Forests.—Proceeding upon this basis the United States government began in 1891 to acquire permanent forest lands, and about one-fifth of the forest lands of the United States are now owned by the public. The location of these forests is shown in Figure 61. The wisdom of forest reserves has been recognized in Canada also, and the Dominion and Provincial governments have reserved a total of more than 150 millions of acres to which they are continually adding. Two-thirds of the total area is in Quebec.

Types of Lumbering Industry.—The conduct of lumbering operations in different forest regions of North America is much affected by geographic conditions. In the forests of the Great Lakes region, New England, and eastern Canada timber is cut principally in the winter. Ice and snow enable the logs to be moved easily to logging railways or to the banks of streams, where they are piled to await the flood waters of spring to float them to a centrally located saw mill on the lower course of the stream. The absence of snow in the forest regions of the South and the West makes very different methods necessary. In the forests of the Pacific Coast states, particularly where the trees are large and the topography rough, flumes, chutes, and steam engines are used for moving logs. In some of the cypress swamps of the southern states logs are floated out in canals dug for the purpose.

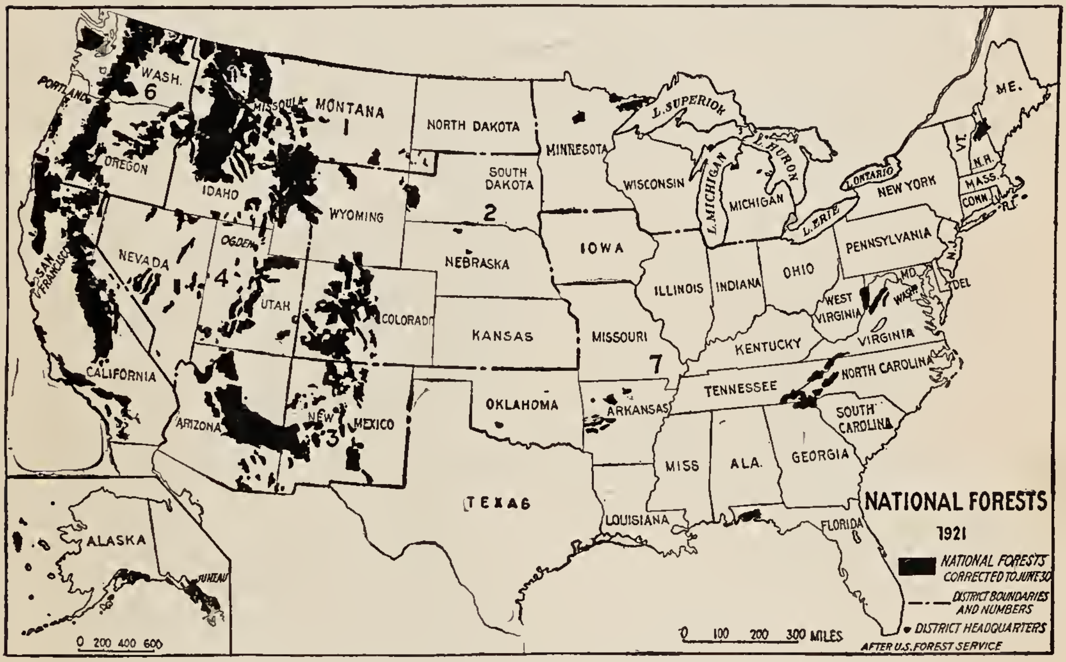

WASH.
6
PORTLAND
MONTANA
MISSOULA
1
OREGON
IDAHO
NORTH DAKOTA
SOUTH DAKOTA
2
WYOMING
MINNESOTA
L. SUPERIOR
WISCONSIN
L. MICHIGAN
MICHIGAN
L. HURON
ONTARIO
NEW YORK
ME.
VT.
N.H.
MASS.
CONN.
R.I.
L. ERIE
PENNSYLVANIA
N.J.
DEL
MD.
WASH.
OGDEN
NEVADA
4
UTAH
SAN FRANCISCO
COLORADO
NEBRASKA
IOWA
ILLINOIS
INDIANA
OHIO
WEST VIRGINIA
VIRGINIA
KANSAS
MISSOURI
7
KENTUCKY
NORTH CAROLINA
TENNESSEE
CALIFORNIA
ARIZONA
NEW MEXICO
3
OKLAHOMA
ARKANSAS
SOUTH CAROLINA
GEORGIA
MISS
ALA.
TEXAS
LOUISIANA
FLORIDA
ALASKA
JUNEAU
0 200 400 600
0 100 200 300 MILES
NATIONAL FORESTS
1921
NATIONAL FORESTS CORRECTED TO JUNE 30
DISTRICT BOUNDARIES AND NUMBERS
DISTRICT HEADQUARTERS
AFTER U.S. FOREST SERVICE

Fig. 61.—Forest lands owned by the United States Government.

Forest Depletion and Migration of the Lumber Supply.—In New England lumbering was an early industry and the forests were the basis of an important shipbuilding industry and also provided the colonists with a commodity for export to Europe) In 1850 New York was the leading state in the cutting of timber and the manufacture of lumber. So rapid was the depletion of her forests that ten years later the lead had passed to Pennsylvania. The northern white pine forests continued, however, to furnish the most desirable lumber and the center of the industry moved westward through Michigan, Wisconsin, and Minnesota. The remaining pine forests of these states are less than 3 per cent of their original extent. For the last 20 years the main source of building timbers has been the pine forests of the South. Now only about 20 per cent of the original supply of southern pine remains, and the rate of cutting is diminishing. One-half of the saw timber remaining in continental United States is in the three Pacific Coast states, and 61 per cent of the total lies west of the Great Plains (Fig. 62). Lumber from the West now predominates in the markets of the Great Lakes region and is an important factor in those of the East. Washington is the leading state in timber production

N.B.

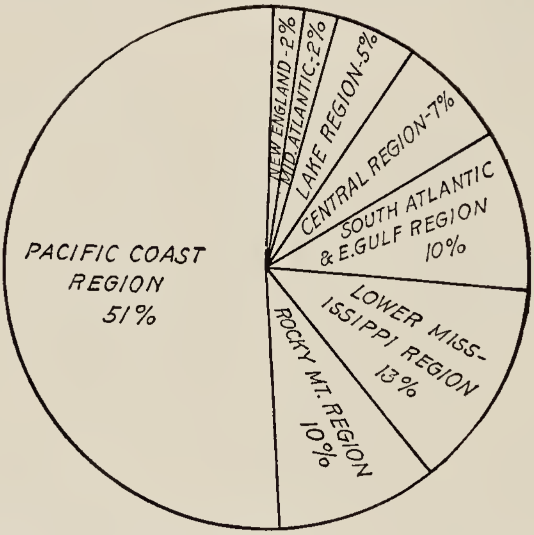
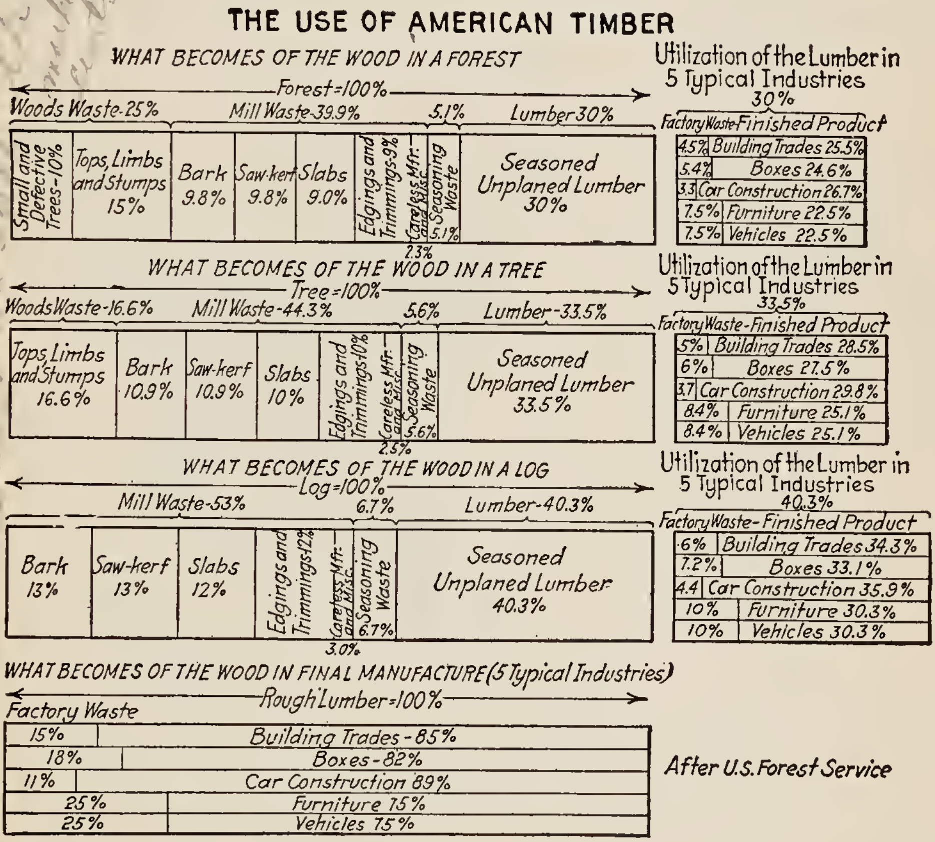


FIG. 62.—The distribution in the United States of the remaining stand of saw timber.

The Lumber Supply of Canada and Alaska.—The rapidly growing shortage of lumber in the United States may not be materially relieved by importation except at high cost. (Only in Canada and to a moderate degree in Alaska do large areas of timber land remain untouched/ The original forests of Canada are estimated at about 600 million acres, or 70 per cent as great as the original forests of the United States. Much of this land is, however, near the northern limit of tree growth, and not more than one-half of the area ever contained saw timber of commercial size. It is obvious that the United States can expect only temporary relief from her timber shortage by importations from Canada.

The heavily timbered areas of Alaska are confined to the rainy sections of the Pacific slope (Fig. 141) and to narrow belts in the river bottoms of the interior; the uplands of the interior having little or no merchantable timber. The principal species of trees in Alaskan forests, like those of much of Canada, indicate that their future importance will be in the production of pulpwood rather than of lumber.

Transportation and Lumber Costs.—The shifting of the lumber supply of North America to the South, and then to the West, has had important consequences, since the principal market has not shifted with the supply, but has remained in the North and the East. One important consequence is the greater freight charges imposed by the longer rail hauls to market. In 1893 the cost for shipping lumber from the Michigan forests to the Chicago market was from $1.50 to $2 per thousand feet, board measure. In 1905 the cost for shipment from Alabama and Mississippi to Chicago was $5.50 to $6.50. In 1918 to 1920 the cost of shipment from Portland, Ore., to Chicago was $15 per thousand feet. After 1915 other items in the cost of lumber increased more rapidly in proportion to the selling price than did the freight charges.


THE USE OF AMERICAN TIMBER
WHAT BECOMES OF THE WOOD IN A FOREST
Forest=100%
Woods Waste-25%
Mill Waste-39.9%
5.1%
Lumber 30%
Small and Defective Trees-10%
Tops, Limbs and Stumps 15%
Bark 9.8%
Saw-kerf 9.8%
Slabs 9.0%
Edgings and Trimmings-9%
Careless Mfr. and Misc.
Seasoning Waste
5.1%
2.3%
Seasoned Unplaned Lumber 30%
Utilization of the Lumber in 5 Typical Industries
30%
Factory Waste-Finished Product
4.5% Building Trades 25.5%
5.4% Boxes 24.6%
3.3 Car Construction 26.7%
7.5% Furniture 22.5%
7.5% Vehicles 22.5%
WHAT BECOMES OF THE WOOD IN A TREE
Tree=100%
Woods Waste-16.6%
Mill Waste-44.3%
5.6%
Lumber-33.5%
Tops, Limbs and Stumps 16.6%
Bark 10.9%
Saw-kerf 10.9%
Slabs 10%
Edgings and Trimmings 10%
Careless Mfr. and Misc.
Seasoning Waste
5.6%
2.5%
Seasoned Unplaned Lumber 33.5%
Utilization of the Lumber in 5 Typical Industries
33.5%
Factory Waste-Finished Product
5% Building Trades 28.5%
6% Boxes 27.5%
3.7 Car Construction 29.8%
8.4% Furniture 25.1%
8.4% Vehicles 25.1%
WHAT BECOMES OF THE WOOD IN A LOG
Log=100%
Mill Waste-53%
6.7%
Lumber-40.3%
Bark 13%
Saw-kerf 13%
Slabs 12%
Edgings and Trimmings 12%
Careless Mfr. and Misc.
Seasoning Waste
6.7%
3.0%
Seasoned Unplaned Lumber 40.3%
Utilization of the Lumber in 5 Typical Industries
40.3%
Factory Waste-Finished Product
6% Building Trades 34.3%
7.2% Boxes 33.1%
4.4 Car Construction 35.9%
10% Furniture 30.3%
10% Vehicles 30.3%
WHAT BECOMES OF THE WOOD IN FINAL MANUFACTURE (5 Typical Industries)
Rough Lumber=100%
Factory Waste
15% Building Trades-85%
18% Boxes-82%
11% Car Construction 89%
25% Furniture 75%
25% Vehicles 75%

After U.S. Forest Service

FIG. 63.

The Manufacture of Lumber.—The annual consumption of timber in America includes 37 billion board feet of lumber, nearly 6¾ million cords of pulpwood, 70 million railway ties, 100 million cords of fuel,[1] besides many millions of poles, posts, and mine timbers. Only the lumber and its products and the pulpwood require manufacture to bring them into usable form.

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[1] U. S. Department of Agriculture, Circular 112.

The most important form of wood manufactory is the saw mill. Because logs are heavy and bulky and because a considerable part of their volume remains as mill-waste (Fig. 63), they are sawed into the more easily handled and more concentrated form of lumber close to the region of timber production. It follows, therefore, that saw mills will be found in every part of the United States and Canada where there are lumbering operations (Fig. 64). The census of 1927 records about 20,000 such mills in the United States alone. It is to be noted, however, that many of them are small. More than half of the 35 billion feet of lumber was sawed in about 800 large mills, of which the majority are in the states bordering on the Pacific Ocean and the Gulf of Mexico.

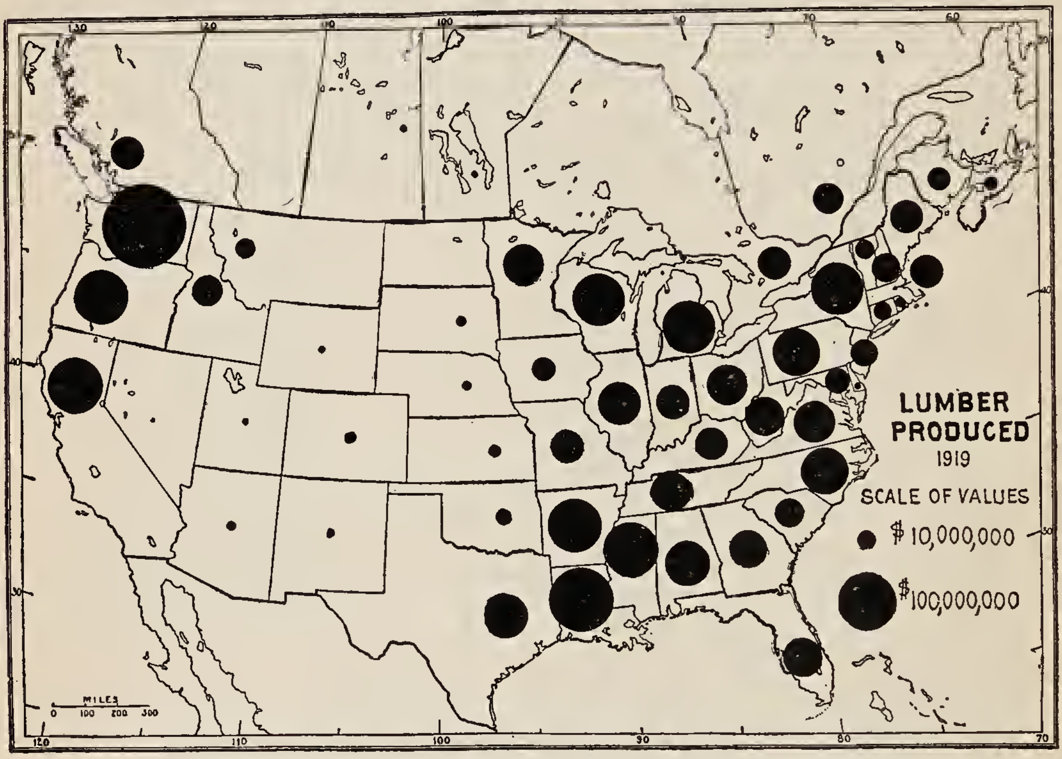

Fig. 64.—Washington is the leading state in lumber production.

The relative importance of the various kinds of lumber manufactured is shown in Figure 65.

Manufacturing Industries Which Use Lumber as a Raw Material.—More than one-third of the lumber cut in saw mills is used in a rough form for construction and similar purposes. Nearly two-thirds of the total, however, serves as raw material in factories which make a great variety of wares in which wood is used alone or in conjunction with metals or other materials. More than half of the total lumber used for manufacturing is consumed by planing mills which make flooring, siding, window sash, moldings, doors, and other house-finishing wood work. Many of these products are bulky or fragile and their manufacture requires considerable power and labor. The establishments are therefore usually located as near as possible to the great centers of population, yet some of this type of manufacturing is done in conjunction with the large saw mills. Planing-mill products are the principal forms of lumber manufacture in nearly all parts of the United States, but particularly in the states which still have, or in the past have had, large timber resources.

The second most important use of lumber is in the manufacture of boxes, crates, standard packages for fruits, and other forms of containers. This industry is also widespread, and in some states it consumes more lumber than the planing mills; this is especially true in New England and California. In addition to boxes and crates, many millions of barrels are required annually for the packing of merchandise. Barrel staves and heading are made in more than 500 widely scattered mills. The industry is, however, more important in Arkansas than in any other state.

house-finishing wood work
containers..

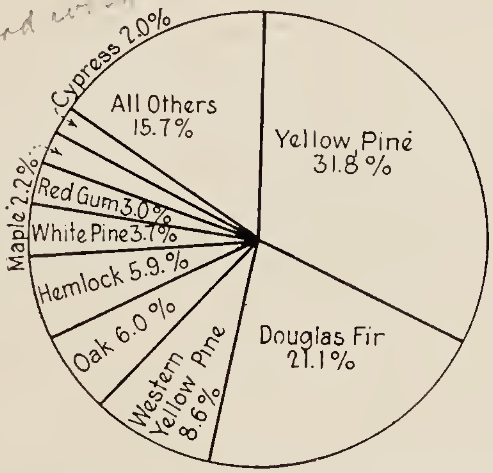

Fig. 65.—Kinds of lumber manufactured in the United States, showing the relative importance of the principal tree species used.

The manufacture of furniture requires many kinds of woods, hard and soft, native and imported and, more recently, steel. The principal woods used in this industry in the United States are oak, red gum, maple, and birch; the principal imported wood is mahogany. (Large quantities of soft woods are necessary also for the interior parts of furniture and for crating furniture for shipment.) (Not infrequently as much wood is used in crating a piece of furniture as goes into its construction.) These conditions, together with the presence of the principal market, and cheap power, are reflected in the distribution of furniture factories through the northern part of the hardwood belt. Two-thirds of all American wood furniture is made in six states: New York, Illinois, Indiana, Michigan, North Carolina and Pennsylvania. Many of the long-established industries have now outgrown their domestic supplies of timber. The great furniture center at Grand Rapids, Mich., finds it necessary to import from other states and countries five-eights of the wood it uses; less than one-ninth of even the oak used there being grown in Michigan.[1] In recent years the abundant steel of the region has been substituted to some degree for wood in furniture manufacture.

The manufacture of vehicles and agricultural implements is located mainly in the district north of the Ohio River, east of the Mississippi River, and west of New England. In the seven states of this group there are manufacturing centers which produce three-fourths of the agricultural implements, one-half of the wagons and carriages, and nine-tenths of the automobiles made in the United States. The same factors (hardwoods, power, and market) which have helped to locate the furniture industry have been influential in the location of these industries also. Indeed, they compete with each other and with the furniture industry for the now limited supplies of hardwoods. An added inducement to their location in this region has been cheap iron and steel which enter into these products to a greater degree than into furniture, and which, for some of the items, such as automobiles, constitute the principal materials.

American Foreign Trade in Timber.—Prior to the World War the export trade of the United States in lumber and other wood products was about 8½ per cent of the lumber cut, and the imports amounted to about one-third the volume of the exports. Beginning with 1917, imports greatly increased and in 1927 they were one-third greater than the exports. The imports are of three general types: (1) cabinet woods, such as mahogany and cedar, from the tropics; (2) saw logs and lumber, mainly from Canada; and (3) pulpwood. The foreign market for American lumber is wide and varied, but the principal demand is for soft woods for constructional purposes. Hardwoods for furniture, finishing, and cooperage stock have also been important exports. The foreign demand is principally for the high-quality clear timber which represents the best of the primeval North American forests.✓

Wood the Principal Source of Paper.—Paper is a felted mass of plant fibers. Former generations made limited quantities of paper in single sheets by slow hand processes from grass, flax, straw, and other vegetable fibers. Much high-grade paper is still made from rags and other relatively expensive materials. Cheap and abundant newsprint and wrapping papers are, however, the result of processes which turn logs of wood into endless strips of paper in the form of rolls having any desired width and weight. One type of machine now in operation manufactures newsprint paper 18 feet in width at the astounding rate of 1,200 feet per minute.

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[1] Maxwell, Hu. The Wood Using Industries of Michigan, The State of Michigan in cooperation with the U. S. Forest Service, 1912.

In 1928 the United States and Canada used more than 12 million cords of wood in the manufacture of woodpulp for paper. The average annual consumption of manufactured and remanufactured woodpulp products in the United States is about 150 pounds per person.

Northern Forests the Principal Source of Pulpwood.—Many kinds of wood are used in the manufacture of pulp for paper. The most important are spruce, hemlock, fir, pine, and poplar. Spruce constitutes about half of the total used for pulp in the United States and Canada.

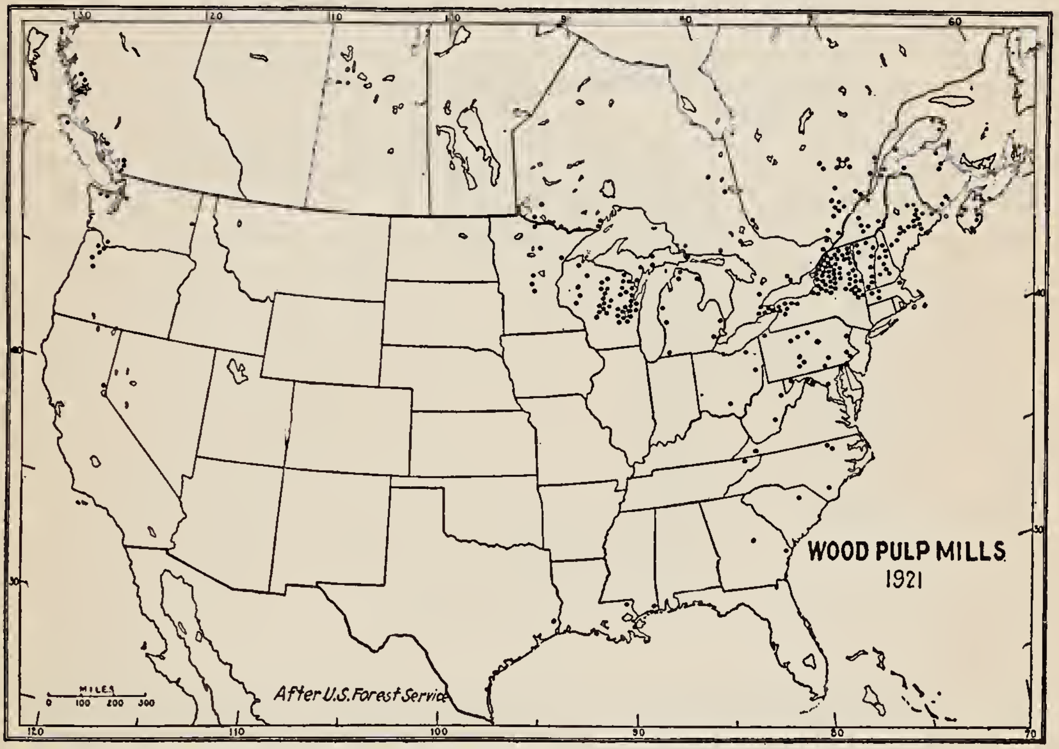

FIG. 66.—Woodpulp mills are most numerous in the region of soft woods and developed waterpowers, and are near the chief paper markets.

Four important methods are employed in the manufacture of woodpulp. They are called the mechanical, sulphite, soda, and sulphate, processes. The three last named break down the structure of the wood by digestion with chemicals. The mechanical process accomplishes the same end by pressing the blocks of wood against large, power-driven grindstones. This is the oldest method and requires the most power. These conditions have helped to locate the pulp mills near the spruce and fir forests and in regions of abundant supplies of pure water and of cheap water power. Figure 66 shows the distribution of North American pulp mills and reflects the factors mentioned. The small number of mills on the Pacific Coast and in the South is due also to the greater distance of their forest areas from the paper markets. The East has not until recently felt any shortage of pulpwood (Fig. 67). Under the stimulus of a growing western market the manufacture of pulp on the Pacific Coast has notably increased. During recent years also the perfection of the sulphate process has made possible the profitable utilization of hemlock and southern pine for pulp. This has opened the door to new and possibly more permanent sources of pulpwood, for under the mild climatic conditions of the South, pine can be grown to pulpwood size in 20 years or even less.

Foreign Trade in Pulpwood and Its Products.—The rapid depletion of the most accessible pulpwood forests of the United States has led to a large import of wood, woodpulp, and paper from the neighboring forests of Canada. In recent years about one-fourth of the pulpwood cut in Canada has been shipped to mills in the United States for manufacture. More than one-half million tons of the pulp made in Canadian mills is also exported, mainly to the United States. The United States also imports annually, mainly from Canada, nearly two million tons of newsprint paper. Exports of similar paper from the United States to foreign countries are very small in comparison with the imports. The export trade of the United States in paper is characterized by many items which have required further manufacture, such as wall paper, bags, board, boxes, stationery, and printed matter.

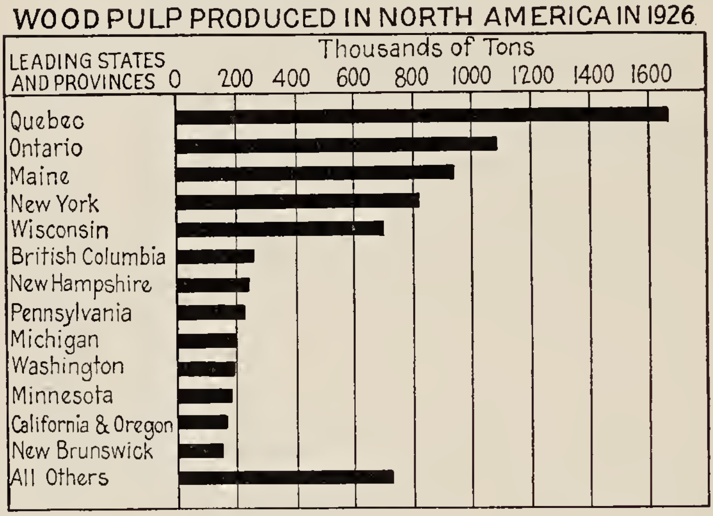

FIG. 67.—The region near the great consuming market for paper outranks all others in the production of woodpulp.

By-products of Wood Industries.—Many products of great industrial importance are manufactured from small timber and from mill-waste. From the distillation of waste hardwoods are obtained wood alcohol, acetate of lime, and a residue of charcoal. The resinous soft woods under similar treatment yield wood turpentine, tar oils, tar and charcoal.

American Naval Stores.—Early in American history the wooden ship-building industry of New England required quantities of tar, resin, and turpentine. These substances came to be known as "naval stores." They are now used principally in a variety of industrial products including paint and varnish, paper making, polishes, roofing, and electrical supplies, most of which are not particularly related to shipping. The naval stores are obtained from various species of resinous pines. The trees are tapped for a yield of gum from which turpentine is distilled, leaving rosin as a residue. The average annual yield of these items in recent years has been about 28 million gallons of turpentine and more than 900 million pounds of rosin. The tapping methods employed in America have been very destructive, and the average life of the tree after tapping begins is only about five years, after which it is cut for lumber. Due to these methods, the turpentine industry, like lumbering, has been constantly migrating. In the early days, New England was the important center of the industry, which later migrated to the South. Production in the Carolinas has risen and fallen; in Georgia it has begun to decline, and in the Gulf Coast states it seems likely to be short-lived. Florida appears to be the hope of the future, due to more efficient control of the forests.

The next most important world region in the production of naval stores is the "Landes" district of southwestern France (Fig. 221). In that region cultivated forests under careful management are made to yield a much more permanent supply of these valuable products than do the American forests under the destructive methods which have characterized their utilization.

American Forests and the Tanning Industry.—The American tanning industry consumes annually several million dollars' worth of vegetable tannins. In the early history of the industry there was an abundance of materials and only the best of oak and hemlock bark was used. As the supplies of such bark grew smaller, the tanning industry required larger supplies and presently it used other material, much of which was imported. In the sources of domestic supply there has been a notable southward shifting. Oak, hemlock, and chestnut trees from the southern Appalachian forests contribute a large part of the domestic vegetable tannins. Tanning extract is also made from the wood of the southern chestnut, which averages a tannin content of 8 per cent. Large supplies of oak and hemlock bark exist in the forests of the West, but at so great a distance from the established tanning centers that their use is limited. They may eventually be profitably made into extracts which can be shipped east. Recently the large supplies of bark available at pulp mills have been utilized by the tanning industry.

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CHAPTER IX

Study

ANIMAL FOODSTUFFS

The Meat Supply

Economic Aspects of the Use of Meat.—The abundant use of meat in a national diet reflects in that country either a primitive state of economic development or a comparatively high standard of wealth. Meat is, in general, an expensive form of food, a form which requires the use of a large area of land which possibly might be devoted to crops destined for direct human consumption. The making of 1 pound of edible pork, for example, requires about 5 pounds of corn, and a pound of beef represents at least 7 pounds of corn besides other plant products. It is obvious that meat production is not the most intensive possible use of agricultural land. Yet meat and meat products are now regarded as essentials in the food supply of nearly all modern nations. In only a few countries, such as China and Japan, has the pressure of population upon the land become so great that strict economy does not permit of the relatively extravagant use of land for the raising of numerous meat animals.

In spite of a very general use of meat in many parts of the world the total quantity consumed is small in proportion to that of some of the food cereals. The world's annual production of meat, outside of China, for which data are not obtainable, is estimated at about 50 billions of pounds.[1] It may easily be computed that, on the basis of calories of fuel value for human consumption, this is the equivalent of no more than about 15 per cent of the fuel value of the world's wheat crop alone. It is obvious that factors other than the fuel value of the meat must be taken into account in estimating the real importance of the meat-producing industries. It is probable that the wholesale market value of the meat consumed in all countries is nearly if not quite equal to the value of the flour made from the world's wheat crop. This statement lends emphasis to the expensiveness of meat as a food.

The World's Meat Animals and Geographic Environment.—The major part of the world's commercial meat supply is obtained from cattle, sheep, and swine. The origin and development of the domesticated breeds of these animals has much to do with their present geographic distribution, and therefore with the character of the meat industry.

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[1] U. S. Department of Agriculture, Office of the Secretary, Report 109, p. 15.

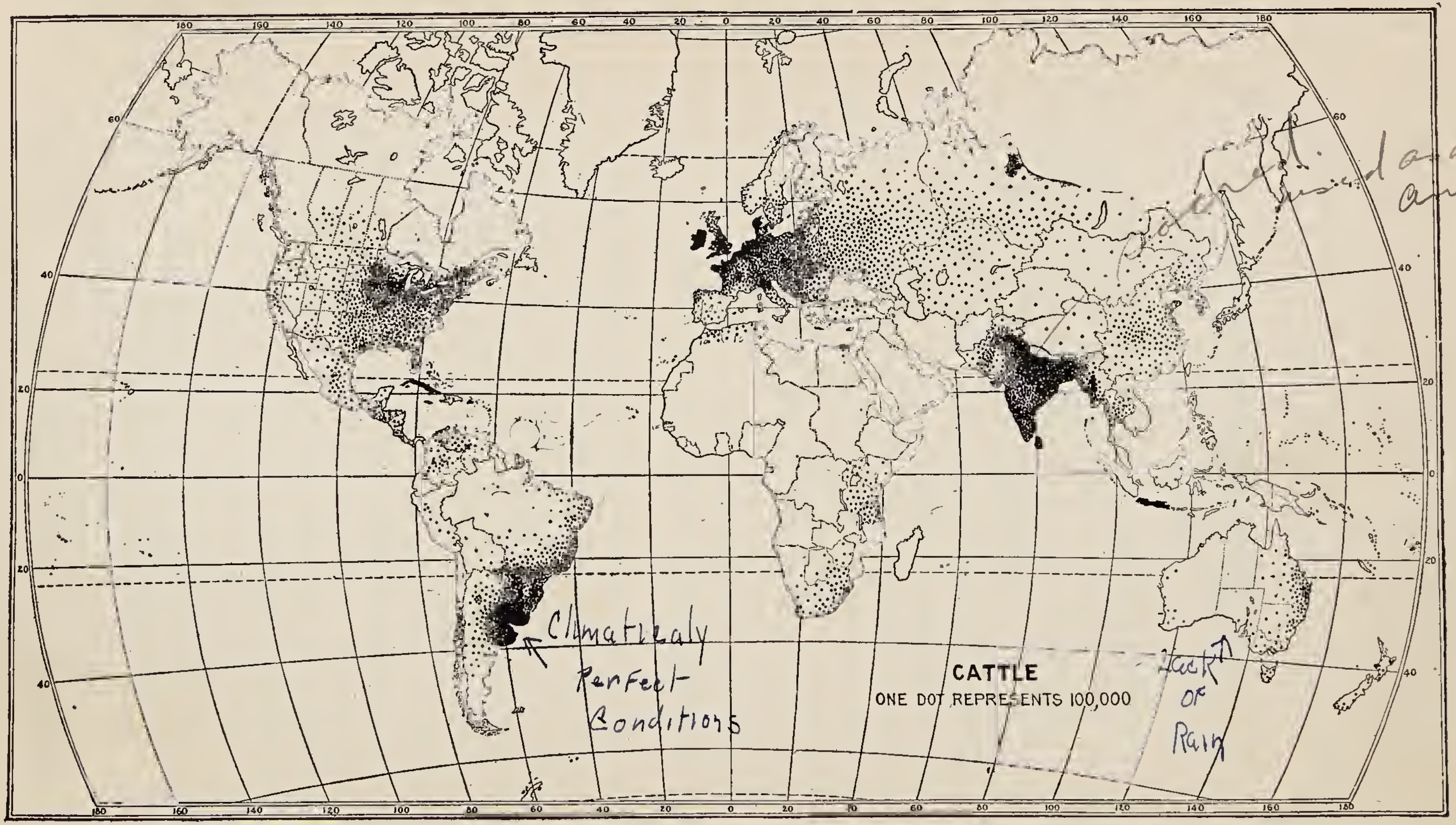

CATTLE
ONE DOT REPRESENTS 100,000

Fig. 68.—World distribution of cattle. The United States has about 10 per cent of all the cattle in the world.

Cattle used a draft animal.

Climatically Perfect Conditions

Lack of Rain

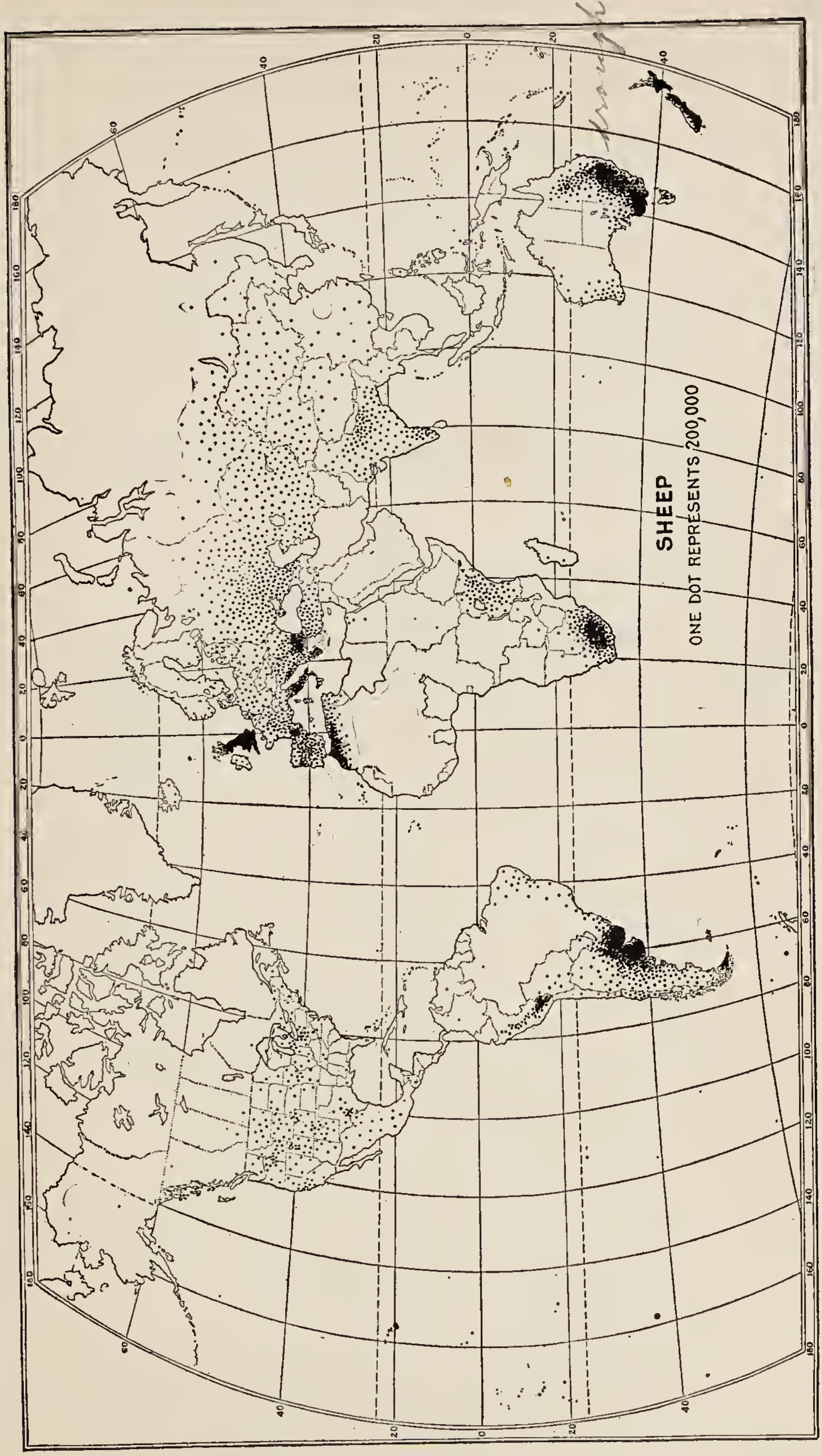

SHEEP
ONE DOT REPRESENTS 200,000

FIG. 69.—World distribution of sheep. The importance of sheep in the relatively dry grass lands of the world is plainly shown.

It is believed that domestic cattle have been derived from types of wild cattle which inhabited the forests and grassy plains of Europe and Asia. In that type of environment they developed characteristics which adapted them to range conditions and to the pioneer life of the new and sparsely settled lands of the new world, as well as to the densely peopled lands where greater care and more concentrated feeds (the products of settled agriculture) could be provided for them (Fig. 68).

The ancestors of domestic sheep were mountain animals, native to the rough, dry upland pastures of southern Europe and central Asia, where neither food nor water are abundant. The present world distribution of sheep (Fig.69), which are particularly important in many rough or subhumid regions, is doubtless a consequence of the ability of the sheep to be at home in such surroundings. Sheep have attained great importance in some humid lowlands, particularly in England, but under the constant menace of lung, liver, and foot diseases from which, in other environments, they are comparatively free.

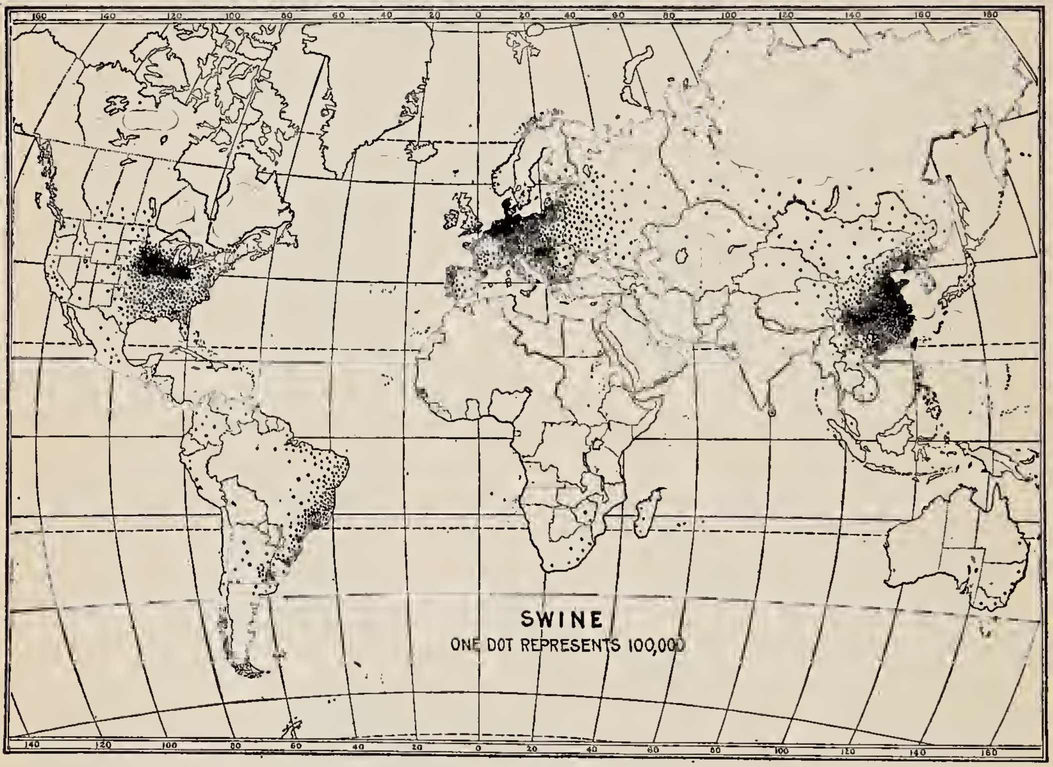


Fig. 70.—World distribution of swine. Swine are most important in certain regions of settled agriculture and expensive land.

Swine, on the other hand, are the descendants of forest-dwelling animals whose life habits were adapted to a rich and concentrated diet of nuts and roots dug from the forest floor. They are not range animals, nor do they promptly attain industrial or commercial importance in new lands. Rather do they, as a rule, follow settled agriculture and live from its products and under the daily care of the farmer (Fig. 70). They show in every way adaptation to an intensive form of meat production.

Dependence of Modern Meat Industry upon Transportation.—Before the era of modern transportation, the growing, slaughtering, and marketing of meat was almost entirely a local industry. So perishable a substance as meat had to be prepared near the consuming market. Under these conditions most countries were necessarily self-sufficing with respect to their meat supply. In the densely peopled lands the rural communities supplied themselves and sent their surplus to adjacent cities, and each city had its own slaughtering establishments. If the animal industries of a country could not provide a sufficient supply of meat, prices increased and the shortage had merely to be endured. In the sparsely peopled grazing lands of the world meat was at the same time often almost worthless and mature animals were slaughtered by the millions merely for the value of their hides and their tallow, as they were in Argentina, for example.

The advent of railways and of steamships, and particularly of refrigerator boats and refrigerator cars, has changed the character of the world's meat industry to a remarkable degree, and nowhere more than in North America. People in the meat-producing regions have not been slow in adjusting their activities to this new condition in their environment.

The Early Development of the American Beef Industry.—Cattle raising in America began in two widely separated geographic regions and under very different economic circumstances. French and English types of cattle were introduced by the colonists who settled upon the Atlantic seaboard from Quebec to Georgia. The cattle were used as draft animals, as dairy animals, and were slaughtered for local meat supply, but they were always the adjuncts of settled agriculture. At an early date cattle of the Spanish type were introduced from Mexico into ranges of Texas. They were reared in the open at a low cost by Mexican ranchers, and since there was but a limited local market for meat the animals were worth but very little. Many were slaughtered for their hides and tallow, products which could be stored and shipped when a favorable opportunity occurred.

Early in the nineteenth century settlers advanced from east of the Appalachian Mountains into the Ohio River valley. Upon the abundant grain crops of their newly cleared farms they could raise cheap beef, but the local market was small. In 1805 cattle were first driven eastward across the mountains to a profitable market in Baltimore. Therewith began a custom which for many years provided New York, Philadelphia, and Baltimore with cheap beef, and the new West with a market. The territory drawn upon for these drives gradually included not only Ohio and Kentucky, but Indiana and even Illinois. This phase of the American beef industry increased in importance up to 1850 and was terminated by the completion of through railways to the East. The cheaper cattle of Illinois and Iowa could then reach the eastern markets without the handicap of the excessively long drive.

The advent of the railways was also a cause for a rapid increase in settlement of the land and the growth of cities in the region between the Ohio River and the Great Lakes. The farmers of the region turned their attention to wheat growing, and the eastern markets drew additional supplies of beef from farther west. Then, for the first time, the ranchers of Texas saw an opportunity to get their cattle to a large and profitable market (Fig. 71). The first attempts were made by driving cattle from Texas to Chicago, but the distance was great and there were many discouragements. However, the rapidly growing tentacles of the railway system were pushing westward and had shortly reached into Iowa, Missouri, Kansas, and Texas itself. (Cattle could profitably be driven to the ends of the newly-built railways, and then be transported quickly to the Chicago market.) Note Many of the cattle received in Chicago during this period were killed to supply the local market; some were converted into salted and cured beef products which could be shipped east. However, the majority of the cattle were shipped alive to the eastern consuming markets. Under the stimulation of new markets the range cattle industry expanded rapidly northward as the herds of buffalo disappeared, and by 1880 the grazing ranges were stocked nearly to the Canadian border. During the succeeding decade the multiplication of branch railways in the cattle country had so far progressed that long drives were no longer necessary and this picturesque phase of the American cattle industry practically disappeared.

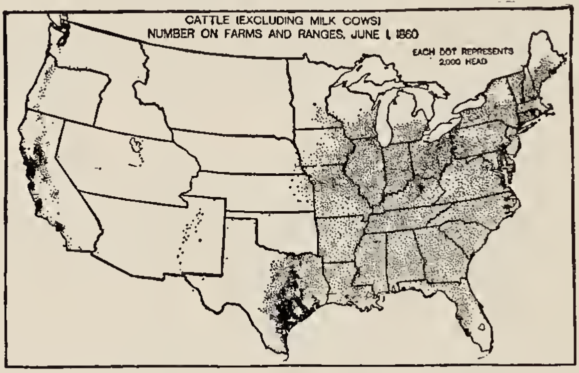

CATTLE (EXCLUDING MILK COWS)
NUMBER ON FARMS AND RANGES, JUNE 1, 1860
EACH DOT REPRESENTS 2,000 HEAD

FIG. 71.—In 1860 Texas and California had many cattle, but very restricted markets. (*U. S. Dept. Agr.*)

The Progress of Agricultural Settlement in Relation to the Sheep Industry.—The early history of the production of mutton and pork in America is closely related to the occupation of the land. In the colonies both sheep and swine were the adjuncts of nearly every farm home.

The sheep were raised primarily for their wool but they also supplied meat.

Early in the nineteenth century the demand for fine wool caused the American farmer to turn from the unimproved coarse-wooled English types of sheep, which they had used for more than a century, to imported Merinos and other fine-wooled breeds. The industry attained great importance in New England and spread through New York and Pennsylvania into the Ohio River settlements, and eventually westward to the Mississippi River. Wool could be shipped eastward by the slow lake and canal transportation of the time, but the mutton of the fine-wooled sheep was inferior and had only local value. Under the competition of cheap wool from the Middle West, wool growing in the East gradually declined and the farmers of the East turned their attention to the raising of mutton for the rapidly growing eastern markets, an industry in which they had the advantage of favorable location. Improved breeds of English mutton sheep were introduced and the wool became a secondary consideration.

Not for long, however, was the East to hold its place in the growing of mutton. The westward spread of the railways which marked such great changes in the beef industry had a no less notable influence upon sheep raising. Prior to the coming of the railways, sheep were few in the dry lands of the High Plains and the Rocky Mountains. Distances over which cattle could be driven were at that period too great for the profitable transportation of wool. The penetration of this territory by the railways inaugurated a sheep industry of a new type—a range industry, independent of any settled agriculture, and its establishment was attended by a long and bitter struggle between "sheep men" and "cattle men." That the industry was successfully established is abundantly evidenced by the fact that the 7,000,000 sheep of the Far West in 1871 had increased to nearly four times that number in 1885. Cheap wool from the range sheep then came into competition with the wool of Illinois and Ohio. The farmers of the Middle West therefore followed the example of the East, many went out of sheep raising, and the total number of sheep decreased, but the breeding of the mutton types of sheep increased.

The Development of the American Swine Industry.—Swine raising in the United States, like cattle raising, was put upon a commercial basis as soon as agricultural settlers took up the rich corn lands of the Ohio Valley. Swine could not be driven to the eastern market so easily as cattle, nor had they the transportable fleece of the sheep; yet pork products, smoked or preserved, became one of the principal exports of the Ohio country at an early date. Cincinnati became a great pork-packing center and pork products moved to market by boat down the Ohio and Mississippi rivers. The forest-fed hog of the East became a corn-fed hog, and interest was manifested in the improvement of breeds. Hog raising followed the agricultural settlers westward across the prairie lands of the corn belt, but never, as in the case of cattle and sheep, outstripped them. The packing of pork products also followed, and before 1870, it was well established in Chicago, St. Louis, and other middle-western towns. Live hogs suffered greater loss in transportation by rail than did cattle and sheep, while pork, pickled in brine or in the form of ham, bacon, or lard, was more readily marketable than was cured or pickled beef or mutton.

The Situation of the American Meat Industry at the Introduction of Refrigeration.—During the period of great railway expansion pork packing was common in the Middle West and large numbers of cattle and sheep also were slaughtered to supply the growing markets of the region. The great eastern markets, however, were supplied with beef and mutton by the local slaughtering of animals shipped from far and near. In 1869 the receipts of cattle at New York City totaled more than 325,000 head. They came from an area which included Canada, Florida, Nebraska, and Texas, though the largest numbers came from Illinois, Ohio, Texas, and the state of New York. In the same year the total receipts of cattle at Chicago were 400,000 head, of which only one-fourth were slaughtered in that city while three-fourths were shipped on to the eastern markets.

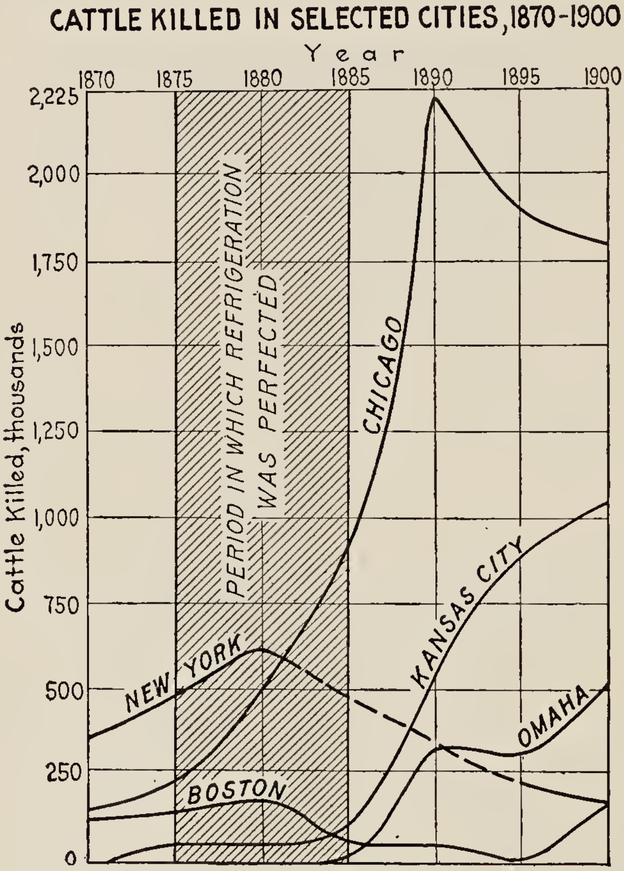


FIG. 72.—Showing the rise of western packing centers during and after the period in which processes of refrigeration were perfected.

The rate of slaughtering and packing of all types of meat for shipment was closely related to the seasonal variations of weather. Principally it was a winter industry and dwindled or ceased altogether with the approach of warm weather.

The general conditions described above would doubtless be characteristic of the American meat industry of the present, except for the perfection of mechanical refrigeration and the introduction of the refrigerator car. These improvements brought about a change in the American meat industry no less revolutionary than that wrought in the vegetable and fruit industries during the same period.

The Influence of Refrigeration on the American Meat Industry.—The direct result of the application of refrigeration to the meat industry was the removal of slaughtering and meat packing from the great consuming markets of the East westward to the regions of animal raising. The economies which dictated this change are easily understood. The quantity of merchantable beef obtainable from ordinary cattle averages only about 50 per cent of their live weight. As soon as it was possible to dress beef near the place where it was grown, transportation was saved on the inedible products. Moreover, when stock is shipped alive over great distances, unavoidable loss and damage to the animals occur in transit. As an adjustment to the new conditions, there occurred a relative decline in the number of cattle killed in eastern markets, a rapid increase of slaughtering in Chicago, and the rise of new packing centers still farther to the west, such, for example, as Kansas City and Omaha (Figs. 72 and 73).

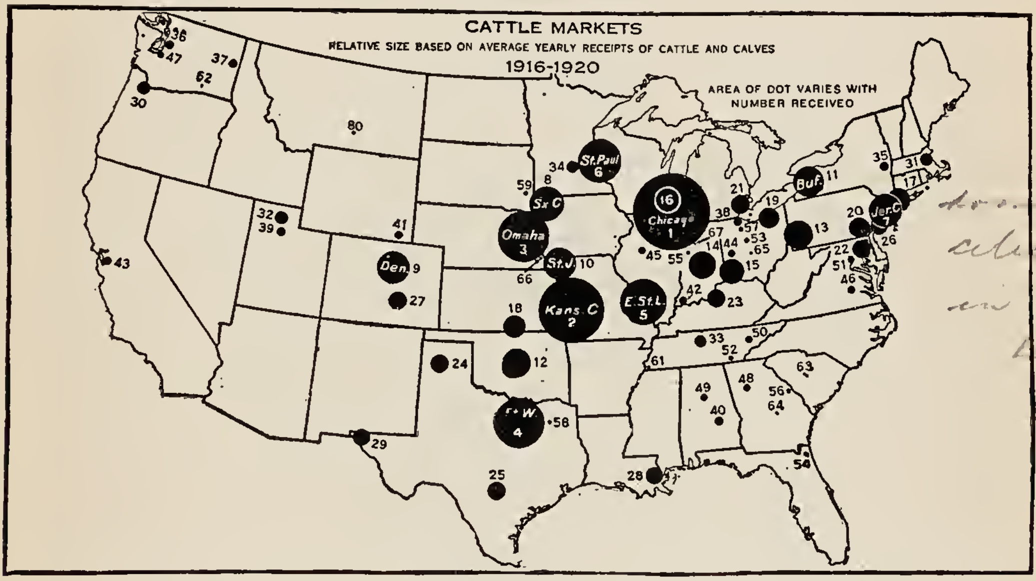

CATTLE MARKETS
RELATIVE SIZE BASED ON AVERAGE YEARLY RECEIPTS OF CATTLE AND CALVES
1916-1920
AREA OF DOT VARIES WITH NUMBER RECEIVED
Chicago 1
Kans. C 2
Omaha 3
F.W. 4
E.St.L. 5
St.Paul 6
Jer.C 7
Sx.C 8
Den. 9
St.J. 10
Buf. 11
16

FIG. 73.—The principal American cattle markets are in the corn belt or upon its borders. (*U. S. Dept. Agr.*)

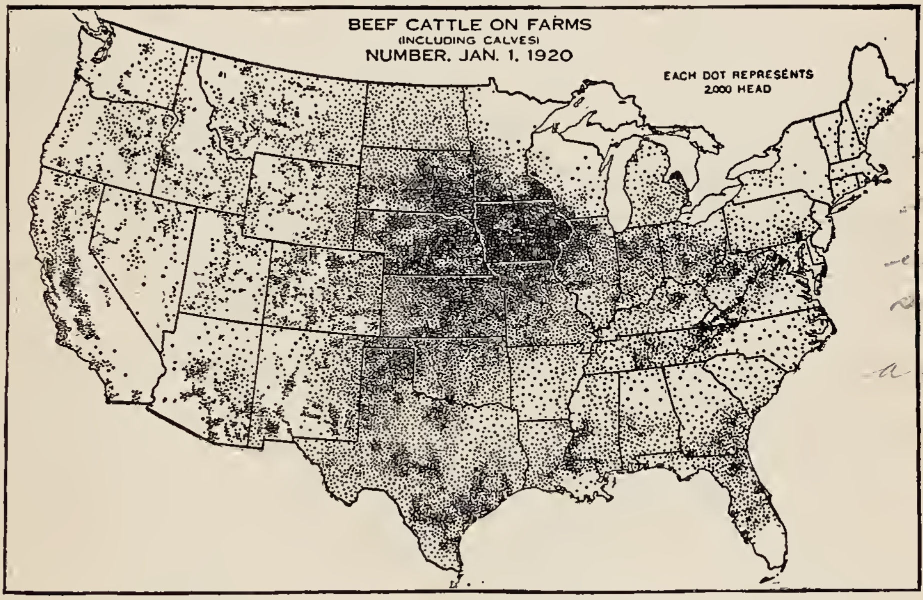
The economies in transportation made possible by refrigeration were accompanied by other economies in the preparation of meat for market. Particularly noteworthy are those which resulted from the centralization of the slaughtering industry and from a large scale of operation. These economies were favorable to the development of the great meat-packing plants and the powerful financial interests which now control the industry in America. The use of refrigeration in the transportation and storage of meats tended also to stabilize the market for meat animals and to free it from wide seasonal fluctuations. Animals may now be killed at any season of the year and there are only minor seasonal variations in the slaughtering of any meat animals except hogs. About 25 per cent of the total American pork supply is still killed on the farms, mainly in the early winter.

Modern Beef Production.—The introduction of refrigerator transportation did not influence the meat packing industry alone. The broadening of the accessible market for meat brought about changes in methods of meat production and in types of meat animals as well. Cattle which formerly moved to market directly from the western grazing ranges were shipped in increasing numbers to the farms of the corn belt to be put in prime condition and then passed on to the market. The cattle marketing centers which are located between the grazing ranges and the corn belt handle most of the young cattle for fattening, and to them the farmers of the corn belt come to buy. In 1920 the cattle received at central markets and shipped out for fattening bore the following proportions to those destined for immediate slaughter: Denver, 66 per cent.; Sioux City, 31 per cent; Kansas City, 31 per cent; Omaha, 28 per cent; East St. Louis, 13 per cent; Chicago, 10 per cent; and Indianapolis, 8 per cent. When dry-farming methods were introduced, settlers took up for cultivation much of the best of the open range, restricting the area for cattle grazing. Moreover, competition in the range-cattle business had been keen. Ranchmen, each bent upon getting his share of the free pasture, had greatly overstocked much of the range and its productive capacity declined. In response to this relative decrease, farmers in the corn belt have greatly increased their production of young cattle and have made of the corn belt the most intensive and most important cattle-breeding and cattle-feeding center of North America.

Note

N.B

Rapid increase in the cost of land and labor also enforced changes in methods of cattle raising. In the period of cheap land it was common to fatten 3-, 4- and even 5-year old cattle for 6 months or more before they were marketed. High-priced feeds have made such methods unprofitable and recent years have seen a rapid improvement in the character of American cattle and an increasing economy in methods of feeding. These changes have been brought about by the introduction of improved breeds of beef cattle noted for their excellence of form, for their thriftiness, and for their early maturity. Cattle in the corn belt are now put on a fattening ration at an average age of 18 or 20 months, and are fattened for about 5 months before they are marketed. (Older cattle fatten more quickly than young animals which are still growing, but less economically, considering the cost of raising them to the fattening age.) Many 3- year-old cattle are still fed in America, yet there is a constant tendency to reduce the age of market cattle. This is evidenced by numerous campaigns for development of interest in the growing of "baby beef" which means early-maturing cattle finished and ready for market at 18 months of age or less. This type of beef has several advantages. (1) Although young cattle do not fatten so rapidly, they make greater total gains in weight on the same quantity of feed than do older animals. (2) The capital invested in the herd is turned over more rapidly. (3) The size and quality of the cuts of beef from yearling animals is preferred by the ordinary consumer to those from more mature cattle. Raising "baby beef" requires experience, however, and an abundance of certain types of feed, and not all regions are adapted to it.



area of
concentration
[illegible]
[illegible]
as corn
belt.

FIG. 74.—The distribution of beef cattle in the United States. Note the relatively small numbers in the western arid lands, in the dairy states and in the cotton belt. (*U. S. Dept. Agr.*)

American Beef-producing Regions.—The distribution of beef cattle in the United States is shown in Figure 74 in which the importance of the corn belt is easily seen. (Corn and clover or alfalfa hay are the most common fattening feeds for cattle in America.) A survey of many farms in the corn belt in 1919 showed that about 35 per cent of the corn raised there was fed to cattle, although only 15 per cent of all the corn of the country is so used. The corn stalks are used as rough feed, and in recent years corn silage has been added to the beef ration by the majority of cattle feeders, particularly in the eastern half of the corn belt.

1.B

Outside the corn belt are other regions which contribute largely to the beef supply of the continent (Fig. 57). In practically all farming districts, either general or specialized, there is normally a surplus of beef which moves to adjacent markets or to the great packing centers. This is particularly true of the spring-wheat belt of the United States and Canada, and of the dairy belt of the Great Lakes region. It is rapidly becoming true of the cotton belt of the South.

American Sheep Regions.—Figure 75 shows the distribution of sheep in North America and clearly indicates the importance of the sheep in the dry upland pastures of the West. The extended market for fresh mutton which came with the introduction of refrigeration influenced the character of American sheep just as it did that of cattle. Fine-wooled sheep have decreased in number and the western ranges carry cross-bred lambs of higher mutton-producing quality.

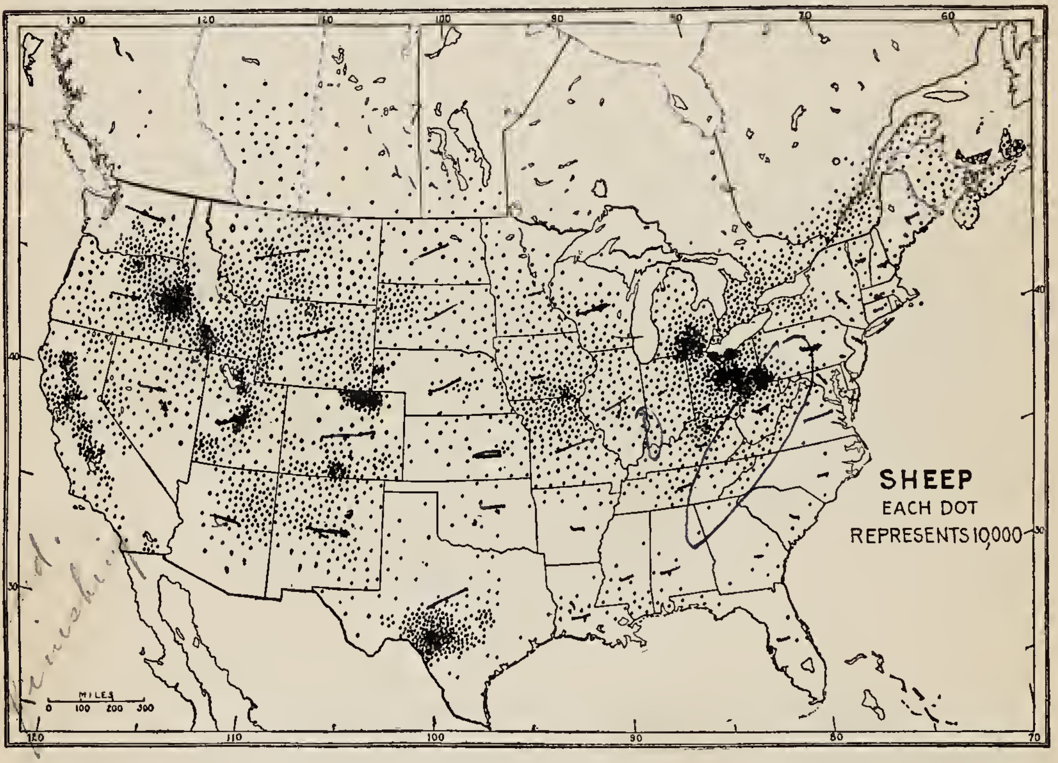


FIG. 75.—The principal sheep-raising and sheep-feeding regions of the United States and Canada.

[illegible]

The mutton industry has two aspects just as the beef industry has. There is (1) the range industry where lambs are raised, but where there is little grain to fatten them for market, and (2) the lamb-finishing industry in the hay and grain belt of the East and in the irrigated sections of the West. Many lambs are raised also in the eastern regions, but the proportion is much smaller than in the cattle industry. One section of the East, the rough lands of the upper Ohio River valley, has maintained importance in sheep raising since its earliest settlement. Yet many hundreds of carloads of range lambs are fattened every winter in Ohio and southern Michigan as well as in parts of the corn belt.

American Swine Regions.—The similarity in the present distribution of swine and of corn in America (Figs. 76 and 20) is obvious, and the reason for the similarity is clear. Corn produces in hogs a desirable type of fat for making lard. The American corn belt farmer, having an abundance of corn, has developed types of swine which are the most efficient lard producers known. There are indications, however, that the day of the lard hog is passing, for cheap vegetable oils from the tropics are cutting into the world market for lard. This may eventually transform the American hog into a specialized producer of ham and bacon instead of fat.

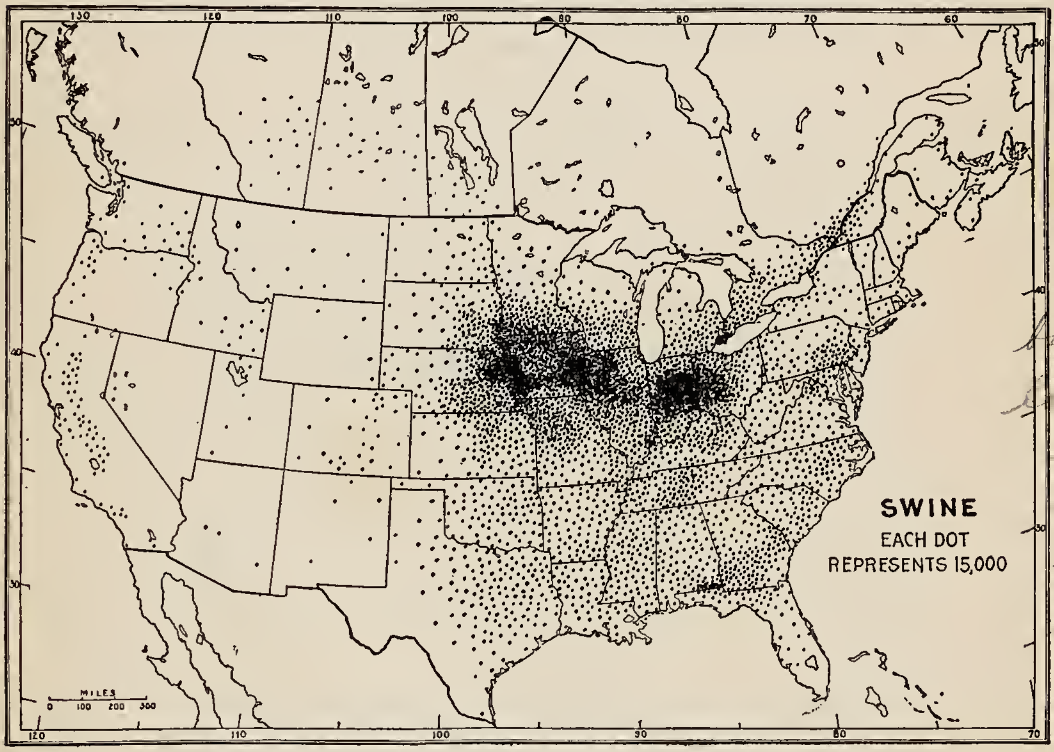


FIG. 76.—The swine-raising region of North America is the corn belt of the United States.

bacon
+
lard
hog
in
Corn
belt.

The Packing and Marketing of Meat.—The conditions which led to the westward movement of meat packing and to its centralization led also to great economy and high efficiency in the disposal of the products of the packing industry. These conditions are (1) rapid transportation and (2) refrigeration. By these means the handicap of geographical distance is overcome and the most perishable of substances can be marketed in perfect condition in distant places (Fig. 77).

parts cut off [illegible] from [illegible]
for food.

N.B. The degree to which the centralization of slaughtering is carried on in America and the giant corporations which dominate the packing industry are unknown in European countries. In a highly favorable environment of cheaply grown meat animals and of a well-to-do meat-eating population the packing industries have had a remarkable growth. Few of these meat-packing concerns have been in existence as long as 50 years, yet they have pushed their influence into every corner of America and into many foreign countries. They have nearly done away with inefficient and unsanitary local slaughtering, and they have found economic uses for the offal of animals which, under earlier conditions, was wasted. They have organized car routes by which distant cities and villages may be supplied with meat at regular and frequent intervals. One of these great concerns has 30 packing plants in Chicago and other American cities with a combined extent of more than 200 acres, with more than 50,000 employees, and with a slaughtering capacity of more than 50,000 animals daily. This same concern maintains about 400 branch distributing houses in various cities, to and from which dressed meat is conveyed in 7,000 privately owned refrigerator cars.

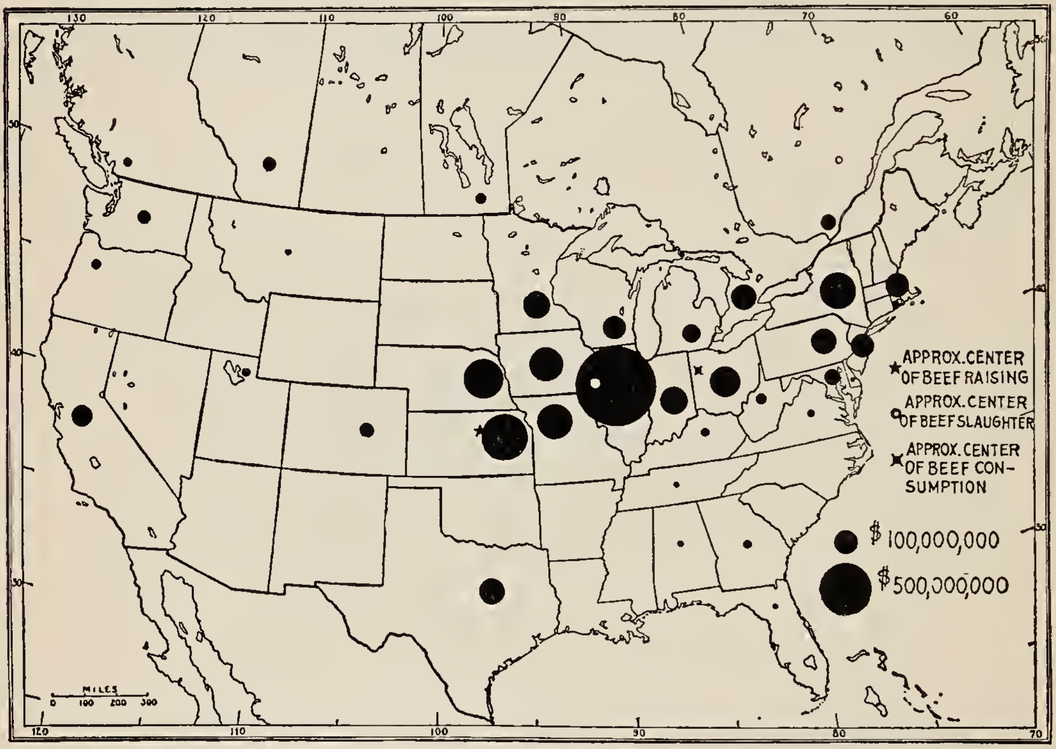

130
120
110
100
90
80
70
60
50
40
30
★ APPROX. CENTER OF BEEF RAISING
○ APPROX. CENTER OF BEEF SLAUGHTER
✕ APPROX. CENTER OF BEEF CONSUMPTION
● $100,000,000
● $500,000,000
MILES
0 100 200 300

FIG. 77.—The relative importance of the leading states and provinces in the meat-packing industry.

American Foreign Trade in Meat.—Throughout the past century the opening of new lands in America suitable for animal raising caused a more rapid growth in the numbers of meat animals than in the human population. This increasing surplus of meat went in various forms to supply the deficiencies of the industrial nations of Europe and of tropical lands which do not produce much meat. Before refrigeration was possible American exports of meat were mainly in the form of salt, smoked, and pickled beef and pork; hams, bacon, lard and tallow. Live cattle were exported only to Canada and the West Indies prior to 1874 when the first important shipment was carried across the Atlantic by steamship. Thereafter the foreign trade in live cattle grew considerably.

Fresh meat, under refrigeration, figured in American exports first in 1876. This item increased rapidly in importance until 1901. After that date the growing industrial population of America made increasingly heavy demands upon the domestic beef supply and a decrease in the available surplus of beef set in, a decrease which became an actual deficit in 1914, when imports of foreign beef exceeded in value the exports of domestic beef. War conditions brought about a temporary revival in the meat export trade of America. However, not only is the general trend of American meat exports downward, but so also is the trend of domestic per capita consumption (Fig. 78).

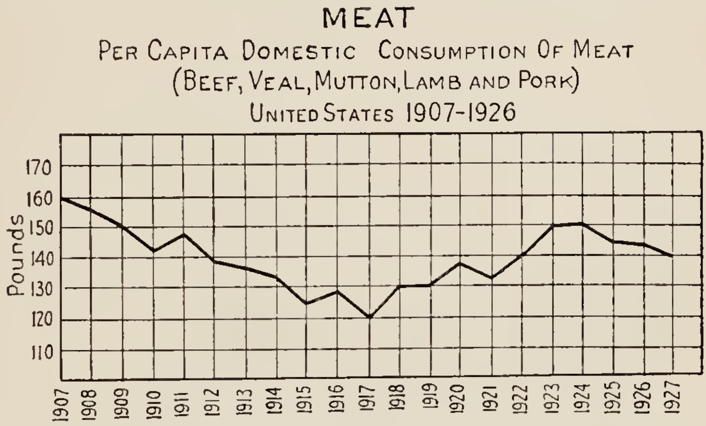


Fig. 78.—After a post-war increase, the per capita use of meat is again trending downward in the United States.

The Dairy Industry

Dairy Animals.—The milk of many types of domesticated animals is used as human food in various parts of the world. Those most commonly employed for milk production are cattle, buffaloes, goats, and sheep. Of these cattle are much the most important. Until within the last two centuries there was little attempt to differentiate between breeds of cattle used for milk production and those used for meat or for draft. Indeed, it is only in the countries of greatest economic advancement that any particular difference is to be noted at present.

The breeds of world-famous dairy cattle all were developed by painstaking selection in the countries of northwestern Europe. In fact, each of the breeds well known in America represents a district in the British Isles or northwestern Europe, such as Jersey, Guernsey, Ayrshire, Holland, and Switzerland. Others, less well known in America, such as the Dairy Shorthorn, the Red Polled, the Dexter, and the Kerry have also been developed in the British Isles.

Fancy breeding animals have been shipped to America from their native regions for many years. In America selection by breeders has further improved the milk production of these cattle and the demand for dairy products has resulted in a great increase in their numbers. (American herds now contain some of the world's most famous dairy animals.)

The Economy of Dairying.—Not only is milk a good human food, but it is an economical form of food. This is especially true if its food value and its cost of production be compared with those of beef.

Ordinary market beef has about 5 times as much food value per pound as average cow's milk. A choice 2-year-old beef steer will yield, including all edible portions, as high as 65 per cent of its live weight in meat, or about 650 pounds. It would therefore require approximately 3,250 pounds (650 × 5) of milk to yield an amount of human food equivalent to that which required 2 years to grow in the form of beef. Data compiled by the United States Department of Agriculture show that the average annual yield of milk per cow in the principal American dairy states is about 4,500 pounds. In some European countries the average is higher: Denmark 5,666 pounds and Netherlands 7,585 pounds, while a world's champion cow has a record of 37,000 pounds of milk in one year. Other figures compiled by the Department of Agriculture show that an acre of land will produce about 4 times as much digestible protein and about 5½ times as many calories of fuel if it is devoted to milk production as it would if devoted to the growing of beef. (U. S. Department of Agriculture, Farmers' Bulletin, 877.) Another authority says, "It is a very conservative statement to assert that, under the very best possible conditions of production with both classes of animals, the cow is more than twice as economical in her use of food energy, when we consider the output for human uses, than is the steer or sheep."[1]

The Ideal Dairy Region.—Dairy cows need a different type of feed from that required for fattening beef. (Much of the heavy ration of grains and other concentrated feeds is replaced by hay, rough forage, and succulent plant products.) Pasture is particularly essential. For these crops and also for the preservation of dairy produce, long cool summers with rainfall uniformly distributed are desirable. One writer describes the typical dairy region as follows:

> The characteristics of a naturally good dairy region will generally be found to be a rolling, undulating, somewhat hilly surface, a soil not too heavy and damp, but deep, loamy, and retentive of moisture; a sweet and nutritious herbage of natural grasses that springs up early and tends to grow vigorously late in the

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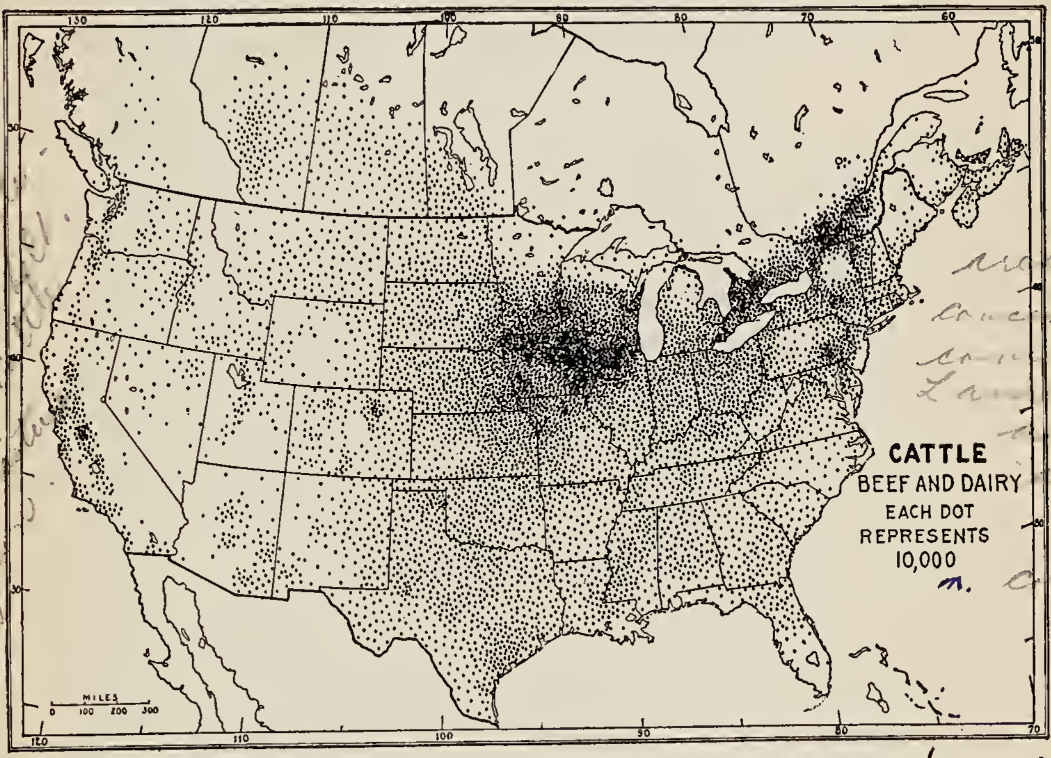
[1] Jordan, W. H. The importance of milk as a food, *Am. Acad. Pol. and Soc. Sci.*, vol. 74, Nov., 1917, p. 188.

season, a somewhat low average temperature with frequent showers in the summer, and a never failing supply of good springs.[1]

Modern invention has done much for the spread of dairying by devising substitutes for various of these geographical aspects of the ideal dairy region. Thus, the silo and soiling crops are used to provide (succulent) juicy feed for the cows during summer drought and to extend the use of such feed throughout the year. Refrigeration is used to protect the dairy produce from the effects of high temperatures, while deep wells and mechanical pumps make a supply of spring water unessential. It is to be noted, therefore, that many important dairy regions of the present have none of these ideal characteristics and only few regions are ideal in all respects.



Area of
concentration
[illegible]

Fig. 79.—Cattle are widely distributed in the United States and Canada. (Beef cattle are most numerous in the corn belt, and dairy cattle in the hay and pasture region of the northeast. Contrast with Figure 74.) Note

American Dairy Regions.—Dairying is an industry of some importance in every settled region of North America. Yet 60 per cent of the milk cows in the United States are in the states north of the Potomac and Ohio rivers and east of the Missouri, while 72 per cent of the cows of Canada are east of the Great Lakes (Fig. 79). This is partially explained by the fact that a little more than 50 per cent of the people of the United States and a little more than 70 per cent of the people of Canada live

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[1] Sheldon, J. P. Dairying, p. 17, London, 1912.

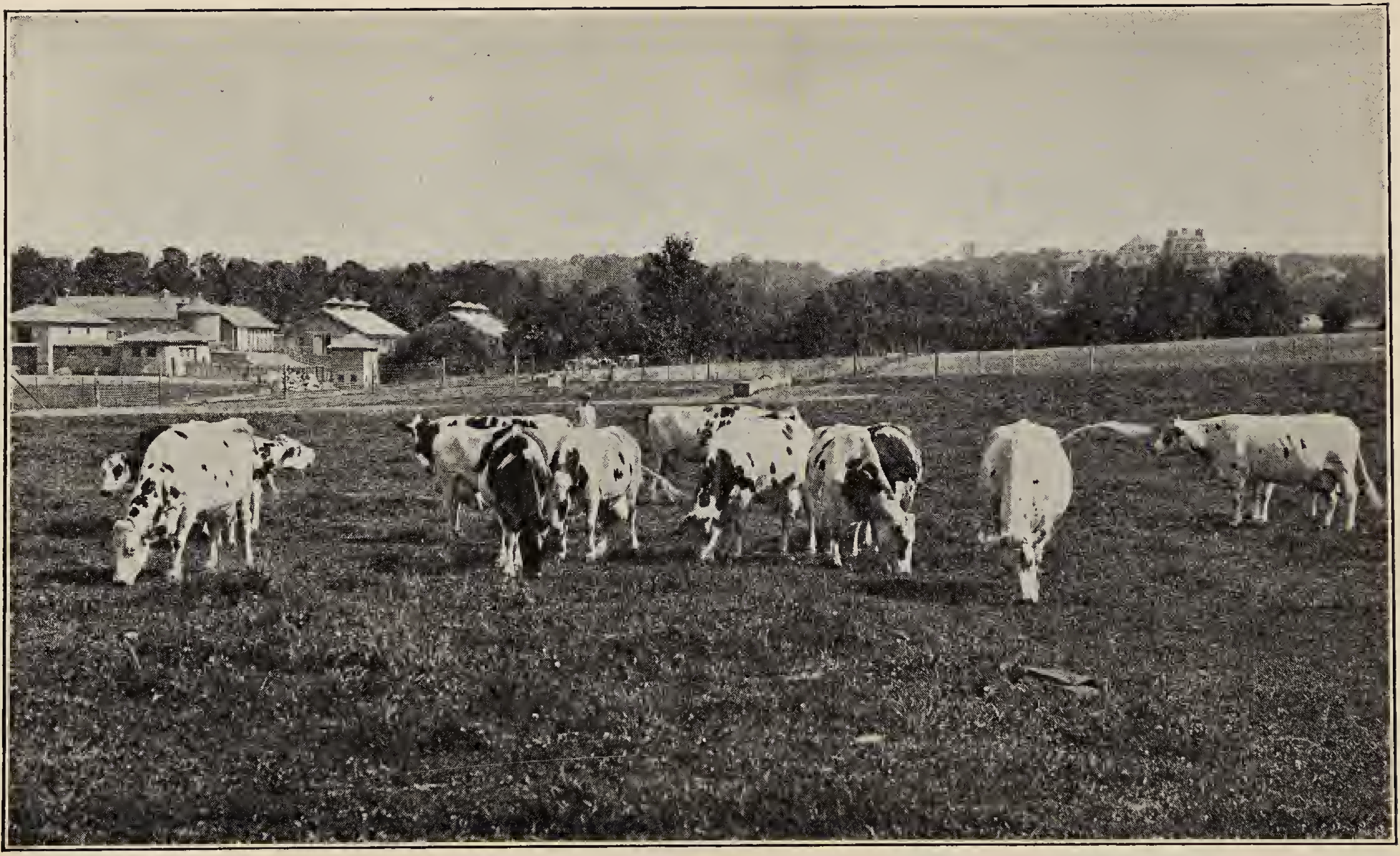


FIG. 80.—A typical American dairy scene. Grass and field crops are transformed by means of the silo and the cow into milk for the nearby city market. (*U. S. Dept. Agr.*)

in this same region. Dairying is a relatively intensive form of animal industry and requires more labor than meat raising. Moreover, the primary products are bulky and perishable and must be produced, like the principal vegetable crops, fairly close to the great city markets (Fig. 80). Yet in addition to these economic influences upon the distribution of dairying there is also a climatic factor. The summer rainfall of the American dairy region is greater and more uniformly distributed than in the western half of the continent, while the summer temperatures are notably lower than those of the South. These climatic conditions are favorable to the production of grass and hay. Abundant summer pasture reduces the labor of summer dairying while the hay provides a part of the winter feed for cows. More than 45 per cent of the hay crop of the United States is raised within the boundaries above described. (It will also be noted from a comparison of Figures 81 and 20 that the principal dairy centers within this general dairy region lie along the northern border of the corn belt where the growing season for corn is sometimes cut short by early autumn frosts.) In this region the silo (Fig. 82) and the dairy industry provide a profitable means of caring for a part of the corn crop, especially that which must be harvested in an immature condition.

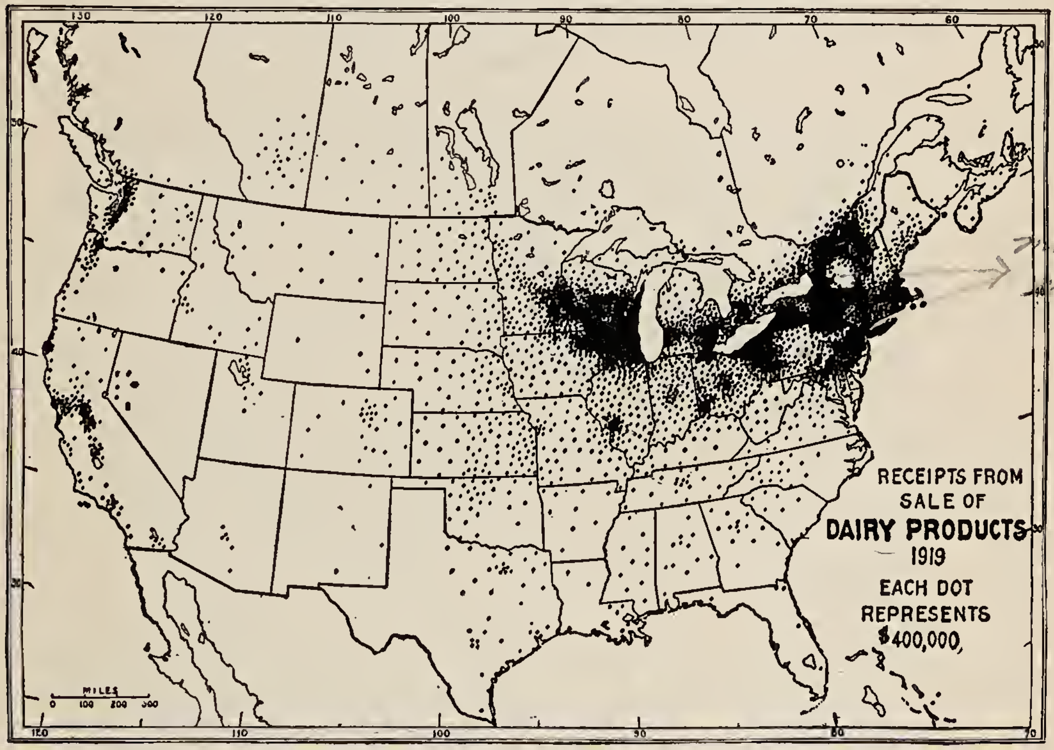


Fig. 81.—The dairy regions of the United States and Canada.

Forms of Dairy Produce.—Most dairy regions market all of the primary dairy products, yet modern dairy regions tend, because of geographic conditions and economic relationship to markets, to specialize in milk, butter, or cheese. The fresh milk trade, because of the perishability of the product, centers about the great city markets or in such localities as have rapid transportation to the great cities. This industry is particularly important in southern New England, eastern New York, parts of New Jersey and eastern Pennsylvania. It is important also in a considerable area immediately tributary to Chicago and other large cities. In regions less advantageously situated with respect to large markets, milk is more profitably employed in the manufacture of butter, cheese, and condensed milk. These products are easily handled and the elements

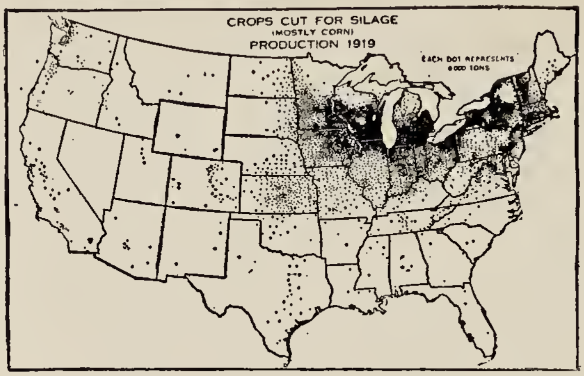

CROPS CUT FOR SILAGE
(MOSTLY CORN)
PRODUCTION 1919
EACH DOT REPRESENTS 1000 TONS

Fig. 82.—The importance of silage in the dairy industry is seen by comparing this figure with the preceding one. (*U. S. Dept. Agr.*)

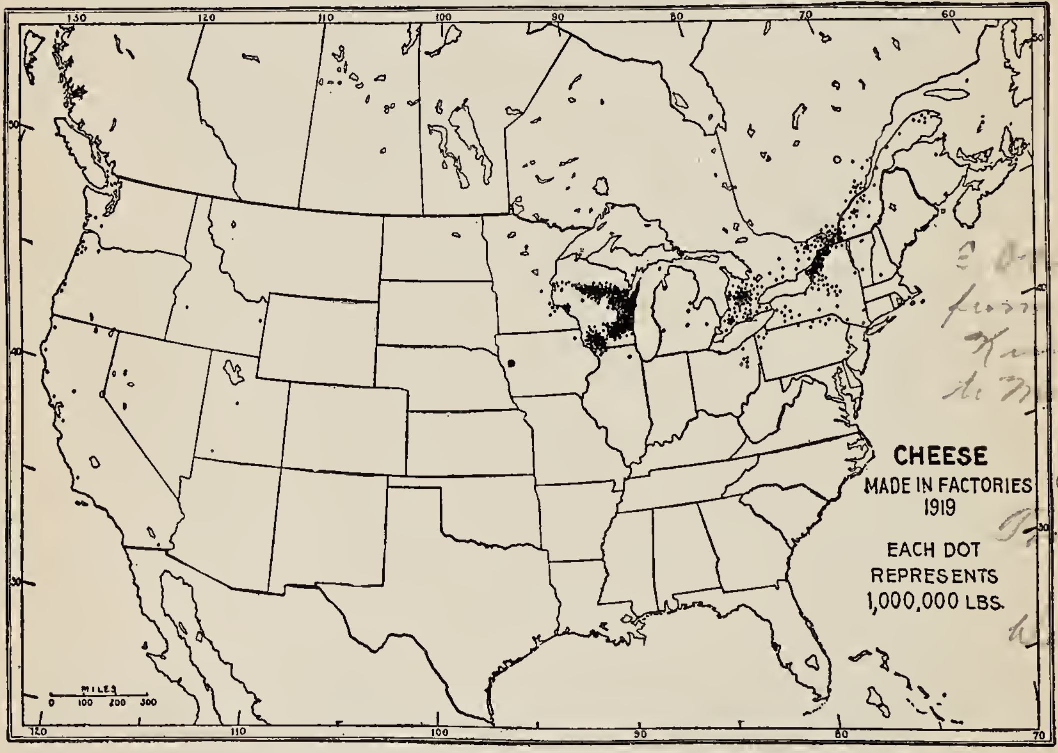
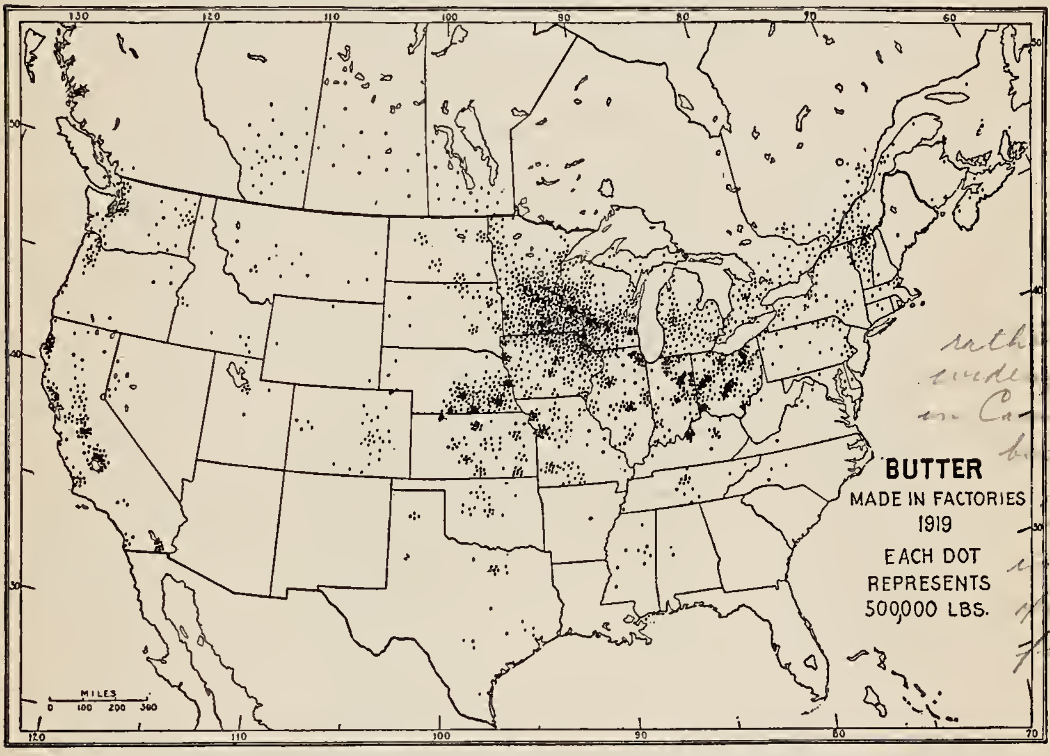

CHEESE
MADE IN FACTORIES
1919
EACH DOT
REPRESENTS
1,000,000 LBS.
MILES
0
100
200
300
130
120
110
100
90
80
70
60
50
40
30

Fig. 83.—Wisconsin and the St. Lawrence Valley are the leading cheese-producing regions of North America.

of time and cost are not large factors in their marketing because of their high value and relative imperishability. The manufacture of cheese is concentrated in the cooler parts of the intensive dairy belt and in districts less accessible to rapid transportation (Fig. 83). Cooler summer temperatures make it possible for farmers to deliver milk at cheese factories in more uniformly good condition, a factor of greatest importance in the manufacture of cheese of high quality. Wisconsin, New York, and Ontario are particularly noted for their cheese. Butter manufacture is more widespread (Fig. 84) and is common in regions of fewer dairy cows

Note.



rather widespread in Cal. & W because fresh butter is valu of the farm

FIG. 84.—A comparison of this figure with Figure 81 shows that butter is not the most profitable form of dairy product near New York, Chicago and other large cities.

in proportion to the area, where a more general type of farming is practiced, and to regions of higher summer temperature. The condition of the milk or cream on arrival at a butter factory is not so critical a matter as it is at the cheese factory.

The growth of city populations in the United States requires ever larger supplies of fresh milk; about 44 per cent of the total supply is now consumed in that form. About 35 per cent is made into butter on the farms or in factories. Condensed, evaporated, and dried milk requires about 8 per cent of the total; ice cream about 4 per cent, and cheese manufacture also 4 per cent. Some is fed to livestock or wasted.[1]

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[1] RUSSELL, H. L. Fifty years of dairy progress. Univ. of Wis., College of Agriculture, Extension Service, Circular 149.

In Canada, where the local market is relatively smaller, the proportions are very different. Butter and cheese, exportable products of milk, employ much larger proportions of the total milk supply than in the United States. Can.

Dairying an Important Phase of American Agriculture.—The importance of the dairy industry to America may be appreciated when it is realized that the farm value of all dairy products in the United States is greater than the farm value of the wheat crop, and that for these products the average American family pays nearly $150 per year. It is not, however, its large value only which gives it great importance. Dairy products are ordinarily subject to much less violent fluctuations of price than are the cereal crops. For that reason there is a noticeable stability in the economic welfare of the principal dairy regions.

Foreign Trade in Dairy Produce.—America's greatest dairy export is cheese, a commodity which originates mainly in Canada. Condensed milk, mainly from the United States, ranks next, while butter as an export is less important. (The ease with which condensed milk and cheese may be handled and the relatively small demand for them in the home markets are doubtless large factors in their importance in export trade.) Dairy produce from the United States formerly went mainly to the Caribbean countries. Although this demand remains, there has been a greatly increased demand in Europe. Not

Although Denmark has sought a market for her butter in the United States, the greatest permanent imports of dairy products into the United States are of cheese. Special types of cheese from Italy, Switzerland, Netherlands, and France are important items but there are also large purchases of common cheese from Canada and Argentina.

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CHAPTER X

FISHERIES

Resources of the Sea.—Water covers about three-fourths of the earth's surface, yet in spite of this great expanse of water, the total value of the world's fishery products is small when it is compared with that of even a single crop like corn. Some of the reasons for this are apparent when it is remembered that all sea life is dependent ultimately upon microscopic organisms which in turn subsist upon materials dissolved in the ocean waters and upon materials derived directly or indirectly from the land. These sources are clearly not comparable with the soil in productivity.

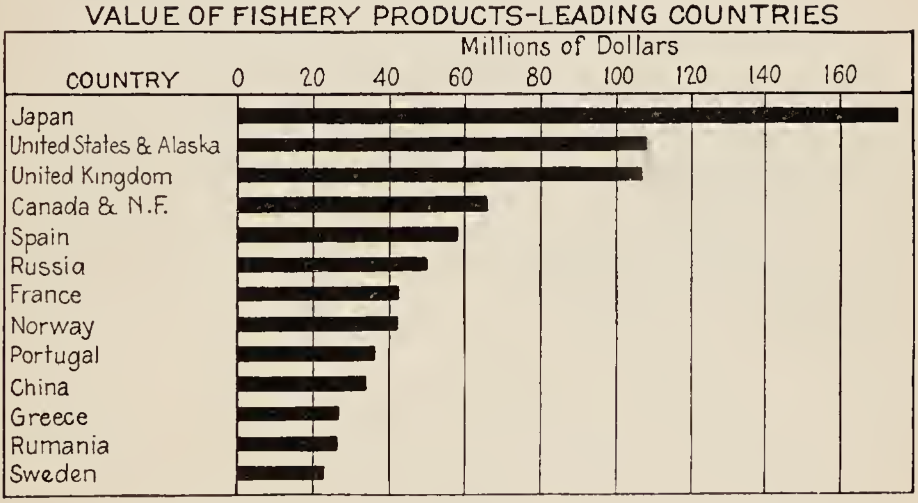

Fig. 85.

Types of Fishing Industries.—The location of the world's important fisheries is influenced (1) by the habits of the principal fishes of economic value, and (2) by the distribution of the food supply of the various species. The three general types of fisheries are (1) deep sea fisheries (2) shore fisheries, and (3) fresh water fisheries.

The Value of American Fisheries.—Among the attractions which first drew European adventurers to the shores of North America were its fish, of which English, French, and Portuguese fisherman gathered a harvest for the European market. Fishing was one of the principal occupations of the New England colonists, and the fishing fleets have continued to be a training school for American seamen.

In comparison with other great industries, however, the money value of the fishing industries is small (Fig. 85). The total income received by United States fishermen for their products probably does not exceed 80 to 100 millions of dollars a year; that received by Canadian fishermen probably does not usually exceed 50 to 60 millions of dollars. All of the fishery products in North America do not, therefore, return to the producers more than about 150 millions of dollars a year, an amount less than that received in a good year by the farmers of the single state of Kansas for their wheat crop alone. The consumers of the dressed, prepared, and canned products of the fisheries, however, pay much more than that sum for them.

American Deep Sea Fisheries

The Whaling Industry.—Under the term "fisheries" is commonly included the capture of marine mammals such as the seal and the whale. Whaling was, in 1845, the leading fishing industry of the United States. The huge mammals were pursued in every ocean for their oil and bone, whale both of which substances have since been replaced in industry by mineral substitutes, and whaling is now a minor aspect of fishing.

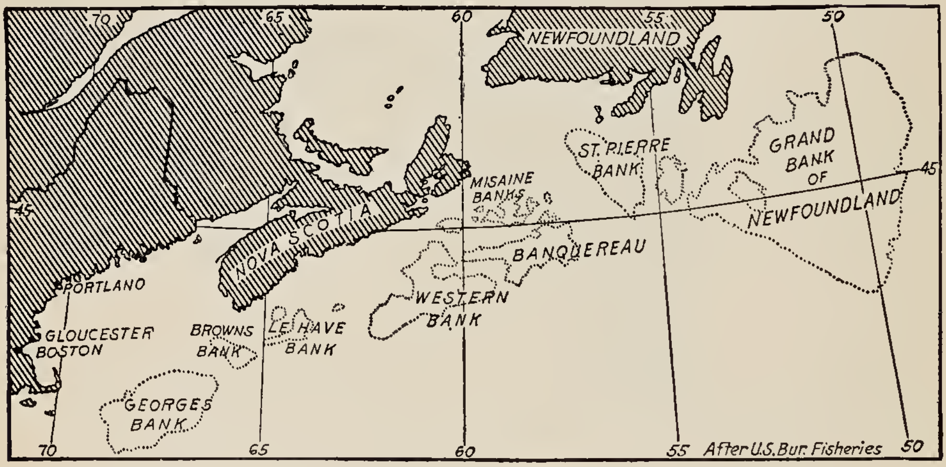
70
65
60
55
50
45
NEWFOUNDLAND
ST. PIERRE BANK
GRAND BANK OF NEWFOUNDLAND
MISAINE BANKS
BANQUEREAU
NOVA SCOTIA
WESTERN BANK
LE HAVE BANK
BROWNS BANK
GEORGES BANK
PORTLAND
GLOUCESTER
BOSTON
After U.S. Bur. Fisheries

FIG. 86.—The principal fishing banks off eastern North America.

The Banks Fisheries.—On the margin of the broad continental shelf which lies off the northeastern coast of North America is a chain of shallow known as the "banks" (Fig. 86). The largest and outermost, the Grand Bank, lies southeast of Newfoundland. The southernmost, George's Bank, lies 100 miles southeast of Cape Cod. Some portions of these ridges, which may be submerged glacial moraines, are covered by relatively shallow waters (25 to 200 feet). Here are the feeding grounds of cod, halibut, and other important food fish. The outer banks lie where the warm moist winds from the North Atlantic drift sweep in over the cold Labrador current, creating dense fogs during which men and boats are often lost. The position of the banks is also on the North Atlantic steamship route and the peril to the fishing boats of being run down in the fog by steamers is one of the risks of the fishermen.

AMERICAN SHORE FISHERIES

Fishing off the Northeast Coast.—The shallow waters which border the Atlantic coasts of Canada and New England are the feeding and spawning grounds of many valuable fish (and shell fish). Cod, haddock, halibut, mackerel, and herring are taken in great numbers by fishermen who fish with lines or operate nets and weirs along shore or who are, at most, but a few hours' sailing from their homes.

The most important branch of both the in-shore and the deep-sea fisheries is that which deals primarily with the cod. On the Banks the fish are split and heavily salted and stored in the hold of the fishing vessel to await the return to port. The catch of the shore fishermen is brought in daily and is sold fresh or is dried with less salt and makes a more easily marketed product. The curing of cod is an industry common to much of the coastal region from Labrador to Massachusetts (Fig. 87). In parts of the region the prevalence of fog and rain makes open air drying so difficult that artificial drying apparatus is employed.

Although fishing interests and fishing villages are well distributed along the coasts of New England and eastern Canada, the industry may be said to center at Gloucester and Boston, Mass., which with Portland, Me., are the principal fish markets of these coasts. They handle the local catch and most of the Canadian fish that are sent to the United States.

The Oyster Fisheries.—The shallow waters of the embayments and margins of the Atlantic and Gulf coasts from Massachusetts to Mexico are the home of oysters of excellent quality. Suitable conditions of environment are found where water under 130 feet in depth has gravelly or sandy bottom to which the larval oysters may attach themselves. Sufficient current is desirable to sweep away stifling deposits of silt and to bring in fresh supplies of the microscopic organisms upon which the oysters feed.

The principal oyster fisheries are those of the Middle Atlantic states, particularly those of Chesapeake Bay. This region contributes more than one-half the entire value of the catch and Baltimore is the great oyster market of the world. There are oyster fisheries on the Pacific Coast, but they are of minor importance.

Note (The oyster industry is one of America's most valuable fisheries, employing nearly one-third of all persons regularly engaged in fishing in the United States.) So constantly are the oyster beds fished that those of the North have declined in importance; those of Maine having been

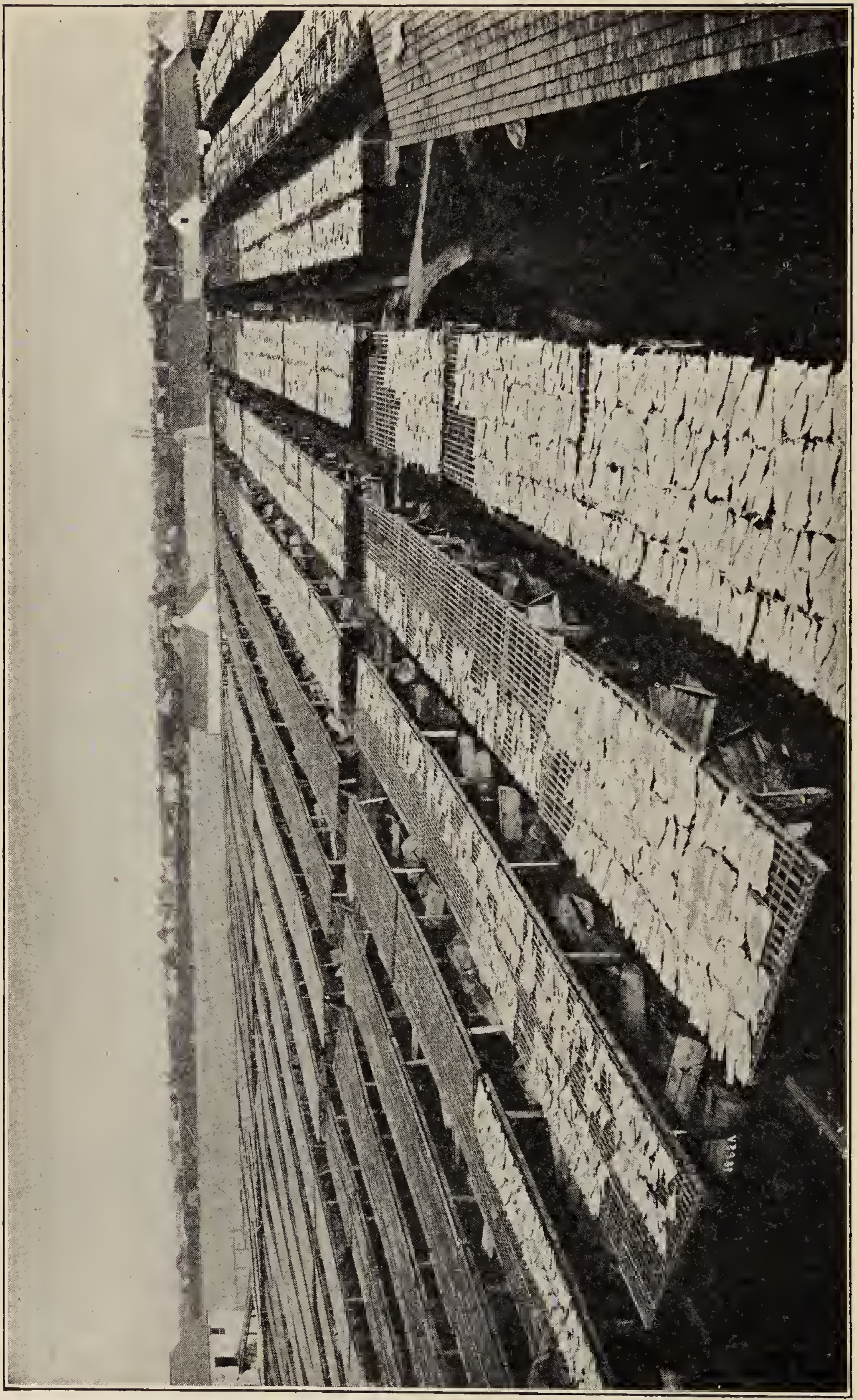

FIG. 87.—Split cod drying on the "flakes" at Gloucester, Mass. Humid climate is encouraging the substitution of artificial heat in drying cod. (*U. S. Bur. Fisheries*).

practically destroyed. Even in the Chesapeake beds the continuation of the supply is secured only by artificial planting and closest attention.

Minor Fisheries of the East.—Among the important sea products of eastern North America are the sponges, menhaden and edible crustaceans. The principal crustaceans are lobsters, caught in the coastal waters of New England and eastern Canada, crabs, and shrimps. The last-named are most abundant in the warm waters of the Gulf Coast. The sponge fisheries are best developed in the shallow waters adjacent to southern Florida, the Bahama Islands, and Cuba. In this industry also the depletion of the natural supply of sponges would soon bring ruin if artificial propagation of the most valuable types were not practiced.

The menhaden fisheries are confined to the waters off the Atlantic Coast. These small fish swim in schools of enormous size, and under favorable conditions they congregate in vast numbers in and about the larger bays and tidal inlets. They are taken principally for their yields of oil and for fertilizer. The factories in which the fish are treated, their oil expressed, and the resulting cake dried and ground into fertilizer, are found from Maine to Florida. More than two-thirds of them are, however, in Virginia and North Carolina. On this section of the coast the fish are very abundant and the factories are near the region of greatest demand for commercial fertilizers (Fig. 121).

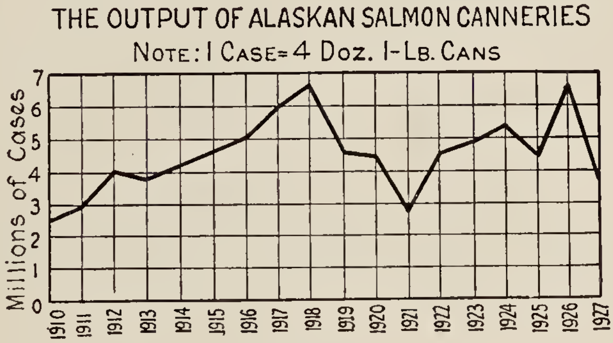

Fig. 88.

[illegible] [illegible] of [illegible] menhaden.

The Salmon Fisheries of the United States and Canada.—The streams which empty into the Pacific Ocean between northern California and Alaska are the spawning grounds of five species of salmon which spend most of their lives in the adjacent salt waters. During the spawning season, which for the different species and different regions includes the spring, summer, and autumn months, they ascend these streams in large numbers and are easily taken. After spawning, the mature fish die. As soon as railway transportation and the perfection of refrigerating and canning methods made the eastern markets accessible, the salmon fisheries grew rapidly on the Columbia River and Puget Sound, and later along the coasts of British Columbia and Alaska. In 1927 the value of the Alaskan fishery products (mostly salmon) was, as prepared for market, nearly 60 millions of dollars, or eight times the purchase price of the Territory. On its coasts were established 135 fish canneries (Fig. 141) which gave employment to 22,000 people (Fig. 88). In 1926 there were 65 canneries in British Columbia the output of which was valued at nearly 19 millions of dollars. The salmon industry is the most valuable single phase of North American fisheries. In these regions, also, excessive fishing has endangered the future supply. Since the fish are taken on their way to their spawning grounds it has been necessary to provide for artificial hatching of eggs and the distribution of young fish, and for this purpose over 100 fish hatcheries are maintained by both private and public enterprise.

FRESH WATER FISHERIES

The commercial fisheries in the lakes and rivers of North America are of small importance compared with the sea fisheries. Most extensive are those of the Great Lakes which are shared by the United States and Canada. The industry provides the markets of the Great Lakes region with fresh fish, of which cisco, lake trout, and whitefish are the most valuable.

The fresh water clams of the interior streams, especially the Mississippi River, have been made the basis of a pearl hunting industry, while their shells furnish the raw material for the manufacture of pearl buttons and similar products.

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CHAPTER XI

ANIMAL FIBERS, FURS, AND SKINS

Animal Fibers

Wool the Most Important Animal Fiber.—Nature has endowed many animals with two types of hairy coverings, one a coarse outer hair, and the other a fine wavy undercoating of wool. The beaver, the seal, and the wild sheep are examples of animals so equipped. In the domestic sheep, selection and breeding have almost eliminated the coarse outer coat, leaving only the wool as a protection. Yet there are in existence, particularly in tropical countries, breeds of domestic sheep on which the hairy coat, like that of the goat, still predominates and in which the undercoat of wool is of no value.

If a fiber of wool be compared under the microscope with strands of cotton, linen, or silk, it will be noted that the wool is covered with minute overlapping scales not unlike those of a young pine cone. When wool is properly treated, lapped, and beaten or twisted these scales cling to one another and give to the woolen fabric its felted quality. For example, the nomads of the Arabian desert have for centuries made their tents of felt from the wool of their flocks. It is primarily these properties of fineness, waviness, and serrate surface to which are due the warmth, wearing qualities, and distinctive spinning and weaving characteristics of wool.

Dependence of Types of the Woolen Industry on Classes of Wool.—The selection and breeding of sheep in various parts of the world have produced fleeces of widely different character. Extremes in this variation are found in the fine silky wool of the pure Spanish or Australian merino, the long coarse wool of the English lowland breeds, and the coarse short staple from the unkempt fleeces of the nomadic sheep native to the highlands of central Asia. Altogether, more than 300 varieties of wool are used in American mills. Yet from the industrial viewpoint they may be grouped, according to three general uses to which they are put, into (1) clothing wools, the finer, shorter-stapled wools used in the manufacture of woolen cloth; (2) combing wools, the longer-stapled and coarser wools used in worsted manufacture, and (3) carpet wool, short coarse wool of poor grade used in carpet and rug manufacture.

"The essential difference between woolens and worsteds lies in the fact that in the manufacture of worsted, the fibers are combed before spinning. The combing process takes out the short fibers (noils) and leaves the long fibers parallel, when they are sent, in the form of 'tops,' to the spinning room. In the manufacture of woolen yarns, on the other hand, the fibers are merely 'carded;' and the 'roving' which is sent to the spinning department is a frail strand made up of fibers of varying lengths which are interlaced in every direction. While this is the essential difference between woolens and worsteds it is not the only one. This combing process in the worsted industry involves so many special problems in respect to raw materials, production methods, and character of the product, that the two industries are quite distinct.

"While the two products, woolens and worsteds, are distinct and the industries which produce them are separate, the idea should not be gathered that the two industries are always operated separately. Much of the machinery is interchangeable with slight modifications, and many mills make both types of product. Furthermore, woolen and worsted yarns are often combined in the same fabric."[1]

The Domestic Wool Supply.—The average annual consumption of new wool in the United States is nearly 500 million pounds, of which normally a little more than one-half is of domestic origin. The domestic wool is grown in every part of the country; yet two-thirds of the total is obtained from the states west of the Missouri River, the northern Rocky Mountain region being the principal area of wool production (Fig. 75). Formerly, nearly all American wool was fine wool, but following the introduction of English coarse-wooled sheep and the growing of cross-bred lambs for mutton, the quantity of domestic coarse wool has increased. Only in the arid plateaus of the Southwest does the fine-wooled sheep still predominate. More than one-half of the western cross-bred wool is, however, sufficiently fine to be classed as clothing wool. Much of it can be used either for carding or for combing. The domestic supply of long-staple combing wool is obtained mainly from the mutton flocks east of the Mississippi River and from Washington, Oregon, and Idaho, where the raising of long-wooled English sheep is a relatively recent development.

The introduction of coarse-wooled sheep has had a notable effect also upon the quantity of wool. Early in the past century the average fleece in America did not weigh more than 3 pounds. The introduction of Merino sheep raised that average by a pound. Still later the increase of English blood in American flocks gradually raised the weight of the fleece to the present average of 7.7 pounds. Thus, while there has been a decline in the number of sheep in the United States since 1900, there has not been a corresponding decrease in the production of wool.

The total number of sheep in Canada is less than the combined numbers in Ohio and Illinois. More than one-half of all Canadian sheep are in Ontario and Quebec. Although the quantity of wool sheared in Canada is not large, it about suffices for Canadian mills. Considerable wool is exported to the United States, but a similar quantity of other grades is imported into Canada from abroad.

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[1] CHERINGTON, P. T. The Wool Industry, p. 1, Shaw, Chicago, 1916.

America Requires Imported Wool.—From one-third to one-half of the wool manufactured in America is imported. It comes from nearly every part of the world. The proportion of the total imports of wool made up of each of the principal classes has varied greatly. In recent years, however, fully three-fourths of the total has been clothing wools derived in largest quantities from the extensive sheep lands of Argentina, Uruguay, Australia, and South Africa (Fig. 89). Next in importance are imports of carpet wool, of which China, with some other Asiatic countries, is the chief source. Combing wool is imported in but relatively small quantity and principally from Great Britain.

Woolen Manufacture an Old Industry in America.—The spinning and weaving of wool began as a household industry soon after the first European settlements in America. In spite of British restriction upon colonial manufacture, the American farmer continued to clothe his family against the rigorous winters with the produce of his flocks. It was not until after the American Revolution that a factory system of woolen manufacture became established. The factory industry was particularly prosperous following 1821, and before the time of the Civil War home manufacture of woolen cloth had nearly ceased.

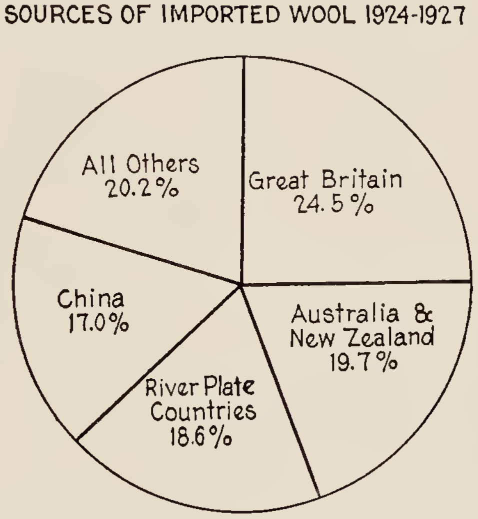

Fig. 89.—Great Britain exports some domestic wool but much also that originated in her colonies.

> "The decline of the household manufacture was followed, particularly in the West, where the wool supply was rapidly increasing in the 40's, by the rise of a large number of small factories. Here we see the industry in its process of evolution from a household basis to a town or small community basis. The introduction of the carding and fulling mills was the first step in the woolen industry away from the self-sufficing economy of the household. Then came

the gradual addition of other machinery and processes, till finally the completed wollen mill or factory emerged. This was a small concern, the number of sets of condensing cards per factory in 1845 averaging about one and three-quarters, and few of the establishments supplied more than a local market.

> "The woolen mill, together with the grist mill, the lumber mill, and the various establishments of similar mill type, all supplying simply a local market or a small community, were a part of that town economy which appeared in this country in the East and the Middle West for a brief period in its industrial history; in the South the scattered population, the absence of towns, and the dominance of the plantation gave the household or the plantation economy a much longer life."[1]

Modern Woolen Manufacture More Centralized.—Most of the numerous small woolen mills of the early period were located primarily with respect to a neighborhood supply of wool and a local market, and secondarily, with respect to a local source of power, usually water power. Note The census of 1870 records 2,891 of these small mills scattered through the territory east of the Mississippi River, though about one-fifth of them were in New England. The products of these mills were mainly plain woolen fabrics for dress goods and suits. In recent decades the growing popularity of worsted goods for men's wear and the substitution of cotton and silk for wool in dress goods have greatly curtailed the business of these country woolen mills. A demand for fancy goods gave advantage to the larger mills with expensive machinery. Many of the small mills have been abandoned (the census of 1925 records but 500 mills both large and small), and such of the small country mills as continue in operation manufacture mainly blankets and flannels. The newer and larger mills are concentrated mainly in the textile district of Massachusetts and Rhode Island, and near Philadelphia.

Worsted Manufactures Outstrip Woolens in Value.—Although the recent census shows only one-half as many worsted mills as woolen, the value of worsted products is nearly twice as great as the value of woolen goods. This fact implies a much greater concentration of the industry in large establishments than characterizes the manufacture of woolens.

> "The chief characteristics of the worsted industry as it is at present constituted are: (1) the relatively large size of the plants, (2) the high degree of specialization, and (3) the high degree of centralization in a few states, and more specifically in the cities of Lawrence, Mass., Providence, R. I., and Philadelphia, Pa. These three cities together produce the greater part of the country's output."[2] (Fig. 90.)

Note As a result of so great a concentration of woolen and worsted manufacturing in the East and particularly in New England, Boston has become the leading wool market of North America.

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[1] Wright, C. W. Wool-growing and the Tariff, pp. 113–114, Harvard University Press, 1910.

[2] Cherington, P. T. The Wool Industry, pp. 8, 9, Shaw, Chicago, 1916.

The Manufacture of Woolen Clothing.—One of the important causes for the reduced number of woolen mills now in operation in America and for the concentration of both the woolen and worsted industries in large mills, is to be found in a change in the location of the market for the cloth. Formerly the market was widely distributed, the cloth being made into clothing by local tailors and dressmakers. The rise of ready-made clothing into popularity has transferred a large part of the primary market for cloth to the great cities which are the centers of clothing manufacture.

As in the case of cotton clothing, the centers of manufacture for woolen clothing are located in the great cities due to (1) the abundant supply of adaptable labor, largely Russian Jews, and (2) the large local markets and good marketing facilities. New York City has more than one-half of the establishments devoted to the manufacture of ready-to wear clothing. Boston, Philadelphia, Baltimore, Cleveland, and Chicago are also conspicuous centers in this trade. (By reason of its relation to the clothing trades as well as its nearness to the great centers of cloth manufacture, New York City has become the great market for woolen and worsted cloth) Here are to be found not only the samples of cloths and clothing but here exist all of the necessary agencies for trading in these wares. To New York therefore come the buyers for firms of various classes in all parts of the country.

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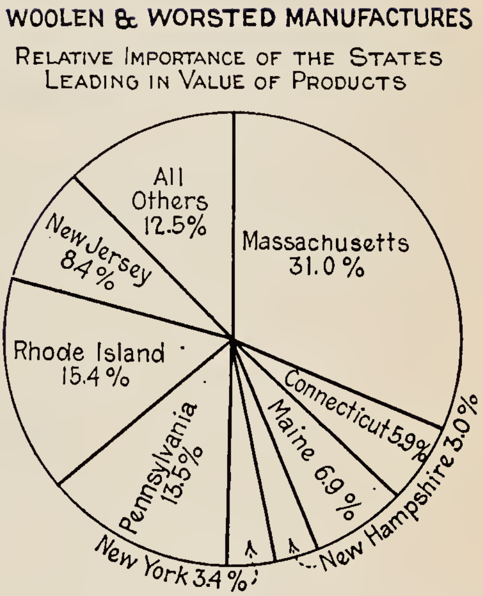

Fig. 90.—Nearly ninety per cent of the woolen manufacturers of the United States are produced in the Atlantic Coast states from Maine to Pennsylvania.

Other users of wool are the carpet and rug, shoddy, knit-goods, and felt industries. Of these none is more geographically concentrated than the manufacture of capets and rugs. Nearly two-thirds of all American rug and carpet mills are located in or near Philadelphia. This fact is due more largely to historical than to geographic factors, though the use of imported raw materials in rug manufacture continues to give a port some advantage over any interior location. Philadelphia is also an important center for knit goods and felt manufacture. The latter industry, which includes hat manufacture as its principal phase, uses cut fur as a raw material to a greater extent even than wool. (Nearly three-fourths of the felt hat manufacturies of the United States are located in Connecticut, New York, New Jersey and eastern Pennsylvania.)

Philadelphia & carpet also concentrated knit goods &

American Foreign Trade Wool in Manufactures Growing.—In spite of the great development of American woolen and worsted manufacture there has continued to be in the country a large market for the finer grades of cloth which come mainly from European mills with their cheaper and more specialized labor. Great Britain is the source of more than three-fourths of these imports. Neither can the rug looms and expensive labor of America compete with the hand labor of Asia in the manufacture of certain grades of rugs. Several million dollars' worth of rugs are imported annually, mainly from Persia, Turkey, and China.

In recent years, however, the products of American looms have been exported in considerable values but not nearly equal to the value of the imported goods. The principal export is cloth, although manufactured wearing apparel is also an item of some importance. The markets for American exports are widely scattered, though the nearby customers, Canada and Cuba, are among the largest buyers.

America the World's Greatest Buyer of Silk.—The expensive agricultural labor of America does not permit silk production in competition with the Orient. (Yet due to high per capita wealth and large population America buys more silk than any other nation.) Of all the silk imported into the United States about nine-tenths, in value, is in unmanufactured form. This silk furnishes the raw material for more than 1,600 mills scattered through many states. As in other textile industries, however, a large part of silk manufacturing is established in a relatively few centers. Nine-tenths of all the silk mills and more than three-fourths of the value of all silk wares produced are credited to the three states, Pennsylvania, New Jersey and New York (Fig. 91).

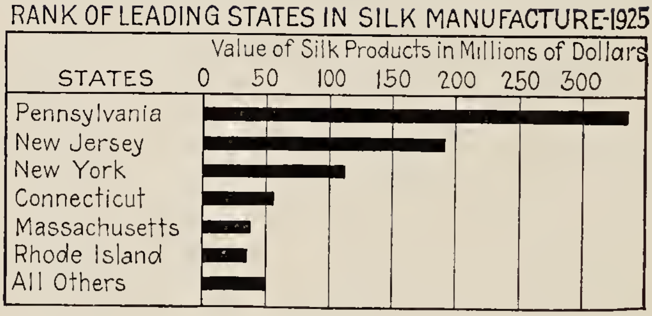

Fig. 91.

In this eastern industrial district there is available a large supply of the type of labor needed in silk manufacture; deft-fingered women and girls whose husbands or fathers may be employed in the iron and steel or other mills of this region. There is, then, some justification for the statement sometimes made that silk manufacture is a "parasitic industry." It is an industry which moves to the labor supply. (The weight of the silk is so small and its value so high that the cost of transportation either of the raw material or of the finished product is a very minor item of expense. The raw silk moves from Japan and China as very high-class freight. In fact, it would be possible to load an entire year's imports into two good-sized ships. From American Pacific ports the silk is carried across the continent in express trains to the principal region of manufacture. One such shipment valued at about 5 million dollars went by a special through train of 14 express cars from Seattle to New York in 100 hours.[1]

THE AMERICAN FUR INDUSTRY

Furs an Incentive to Early Exploration in North America.—Few of the natural resources of North America exerted a greater influence upon its early history than did the fur-bearing animals with which its forests and streams abounded. From the early settlements on the lower Hudson to those of a later day on the lower Columbia River there are many North American cities and towns which owe their location to the establishment of fur-trading posts. If all were named, it would be a long and interesting list. To the settlers of New England and of eastern Canada particularly the trade in furs, along with forests and fisheries, offered prospects of immediate income, where the ice-scoured rocks and boulder-strewn soils promised but little room for the expansion of agriculture. Furs furnished the incentive for some of the earliest exploration and soon replaced the search for the "Northwest Passage" as a reason for penetrating the interior of the continent.

Geographic Conditions Favorable to Fur Production in North America. For nearly 300 years the fur trade has flourished in North America. Some of the fur-bearing animals have been greatly reduced in number, and it has been necessary to protect most, if not all of them, by legislative restrictions. Yet this continent remains unexcelled in the volume, variety, and beauty of the furs it is able to produce. This fact is attributable in large measure to climatic and other environmental conditions favorable to the growth of furs of high quality and to the organization of the fur-collecting industry. (1) The long cold winters of northern North America put the coats of the fur bearers into prime condition and give a long season in which they may be captured before the fur begins to suffer from the approach of warm weather; (2) the geological and climatic conditions of the Laurentian upland and its outliers have rendered it unattractive for agricultural settlement and it has therefore remained a great retreat for fur-bearing animals; (3) the numerous glacial streams, lakes, and marshes of North America constitute the homes of some of the most abundant and valuable fur-bearing animals, such as the beaver, muskrat, otter, and mink; (4) these same waterways furnished a ready-made means of access to the fur regions, a means which still remains the only one available in nearly half of the continent.

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[1] *Scientific American*, Dec., 1922.

Fur Famine and Fur Farming.—The rapid exploitation of what was deemed an inexhaustible resource has greatly reduced the supply of North American furs. At the same time a general increase in population and wealth in Europe and America has intensified the demand for furs, and fabulous prices are paid for the best of each year's catch.

Fur farming, as an industry, is the natural outgrowth of high prices and the prospect of still greater fur shortage in the future. The industry, which is concerned mainly with the propagation of the valuable silver fox, is found in many parts of Canada and northern United States, but is most intensively developed in Prince Edward Island, in Canada. Yet, the value of the furs sold from all the fur farms of Canada in 1926 did not amount to more than 10 per cent of the value of the wild furs captured in Canada in that year, but the supply from fur farms is increasing rapidly.

America a Great Fur Market and Manufacturer of Furs.—In 1764 a fur-trading post was established on the present site of St. Louis, Mo. By its location it was able to command a large part of the fur trade which came down the Missouri River from the far Northwest and also that which came from the north down the Mississippi. This post became in subsequent years an outfitting point for fur traders and a central market and distributing point for furs. This ancient interest the city has maintained and expanded in spite of a vast growth in other forms of enterprise, and St. Louis now holds rank as one ot the principal raw fur markets of the world. To the annual auctions of St. Louis there come furs of many kinds from all of the fur-producing regions of the world, and buyers who represent the fur manufacturers. The total dealings in 1920 amounted to 25 million dollars. During the World War, Montreal also assumed a place of increased importance as an international fur market. For many decades it has been the custom to ship American furs to Europe, especially to London and Leipzig, for dressing and dyeing. In recent years, however, great progress has been made in these arts in America, and New York City and Newark, N. J., have become the principal American centers of the industry.

AMERICAN LEATHER MANUFACTURES

Importance of Leather Manufacture.—Few peoples have had a civilization so primitive that they did not possess methods of tanning leather, and some processes perfected long ago have never been excelled by modern industrial art. In every civilized nation, even those which support but few domestic animals, leather is made to serve many essential purposes. The United States is the world's largest manufacturer and user of leather.

Tanbark Supply Affects the Location of Leather Manufacture.—The raw materials used in leather manufacture include (1) hides and skins, (2) tanning materials, and (3) numerous minor materials used in giving pliability, finish, and color to the leather. In the early history of American tanning all of these materials could be obtained in almost any community. The local slaughter houses and farms furnished hides and skins and the local forests yielded oak and hemlock bark. Small tanneries were then scattered throughout the settled portions of the country, and the leather was used mainly by local shoemakers and harness makers.

Note As the clearing of the forests progressed local supplies of tanbark dwindled. Moreover, it began to appear that the hides and skins of various parts of the country yielded classes of leather, not all of which could be used locally, and improving transportation facilities made it possible to assemble raw materials from many sources at a reasonable cost. Tanneries which were most favorably located with respect to all of the raw materials and the markets expanded their operations, while those less well situated went out of business. In 1870 the leather-manufacturing establishments of the United States numbered 7,569, and the value of their products was about 157 million dollars. Consolidation has progressed steadily and in 1925 the number of establishments was only 532 but the value of their products was nearly 462 million dollars.

In this readjustment it was the source of tan-bark and the location of the principal markets, more than the source of the hides and skins, which determined the growth of the great tanning centers. In the manufacture of hemlock-tanned sole leather, one ton (2,240 pounds) of bark will tan about 2 average cow hides (115 pounds) and, together with minor ingredients, will make of them about 190 pounds of sole leather. In the tanning of light upper leather only about one-half as much bark is required.[1] It is obvious that the relatively small quantity of compactly baled hides can stand the cost of transportation better than the large quantity of loosely corded bark and perhaps even better than the finished leather. The great tanneries tended, therefore, to establish themselves in close proximity to the oak and chestnut forests of the Appalachians and to the hemlock timber of the Allegheny Plateau and of the Great Lakes region, and also near to the large industrial markets rather than in the centers of animal raising. The forests of Pennsylvania provided large supplies of all the principal native tanning materials and were also admirably situated with respect to the leather markets. It is not surprising therefore that in 1880 Pennsylvania had one-fifth of all the tanneries of the country.

The Modern Tannery Not Dependent upon Tanbark.—The leaching of tannin from the tanbark was formerly carried on in the tanyard, but it is just as satisfactorily done in the bark-producing district. The obvious economy in the latter practice appeared as the sources of bark gradually receded from the established tanneries due to timber depletion. The shipment and use of large quantities of tanning extracts instead of the bark made the necessary adjustment to growing distance. Still later the importation of foreign extracts and tanning materials and the increase in chemical tanning, particularly of the chrome processes, has rendered the location of the modern tannery quite independent of the supply of domestic tanbark. Yet, due to the influence of the location of leather markets and to the persistence of a rooted industry, there has been comparatively little shifting in the location of tanning centers as a result of this emancipation (Fig. 92). Pennsylvania continues to lead in leather manufacture and Philadelphia is the foremost city.

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[1] WATT, ALEXANDER. Leather Manufacture, pp. 272–275.

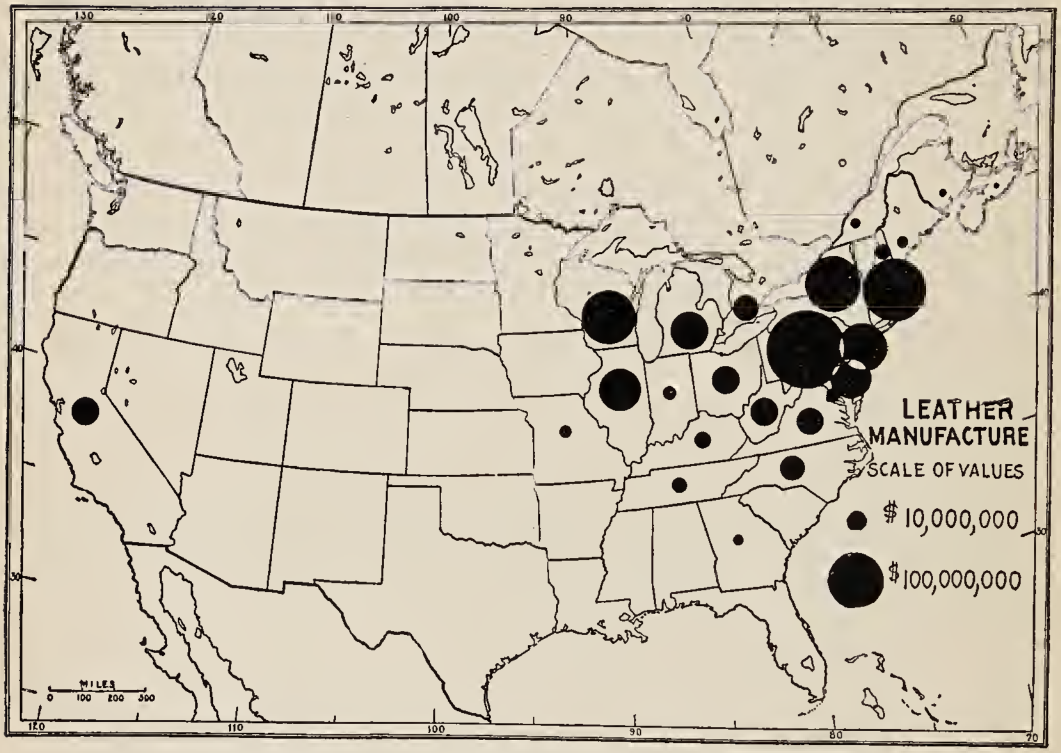

Fig. 92.—The relative importance of the leading states and provinces in leather manufacture.

Ports Influence the Location of Tanneries.—America is so large a user and exporter of leather and its products that even the large domestic supplies of hides and skins are wholly inadequate. Approximately 1.B. three-fourths by number and about one-half by value of all the hides and skins used in American tanneries are imported. The imports include large numbers of cattle hides, mainly from South America; calf skins and sheep skins, of which Europe is the principal source; and millions of goat skins, practically the entire American supply of which is imported, mainly from Asia. The principal trade is through the Atlantic ports, Boston, New York, and Philadelphia. It is therefore fully as important that the modern tannery be located near these ports as that it be convenient to the great packing houses of the Middle West. Not only are hides and skins imported but many of the tanning agents now used are obtained from foreign sources through these same commercial gateways.

America the World's Greatest Shoemaker.—The largest use for tannery products is in the manufacture of shoes. So varied are the aspects of the shoemaking industry that it includes in its raw materials rubber, felt, fiber, and wood as well as many classes and grades of leather. Until about 1850 shoes were made in small shops by hand. In the 35 years subsequent to that date there were invented in America the principal machines which have revolutionized the manufacture of shoes and have enabled the United States, with expensive labor, to sell shoes in competition with the European product, even in the European market. The domestic market is, however, much the largest. Nearly 350 million pairs of boots and shoes are made annually in the factories of the United States. Exports of American boots and shoes, while they are larger than those of other countries, do not normally exceed 2 per cent of the number manufactured, and for these the largest markets are in the nearby countries, Cuba, Mexico, and Canada.

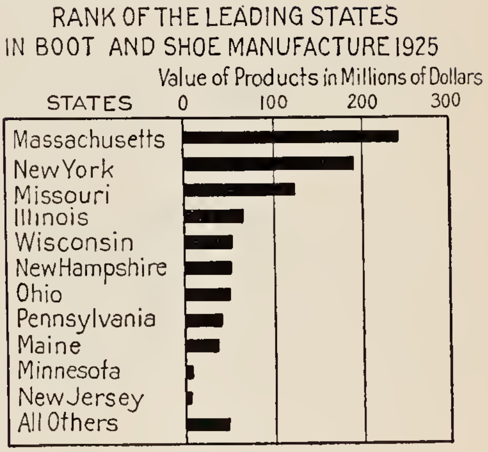

FIG. 93.

Shoe Manufacture Located near the Leather Supply.—Since the great tanneries have located principally in the industrial region of the United States it follows that the shoe-manufacturing industry when located in the same region has the double advantage of proximity to both raw material and markets. In 1925 there were 1,460 boot and shoe factories in the country of which six-tenths were in the region between southern Maine and the city of Philadelphia. A like proportion of all the shoes were made in these factories, while one-fourth of the total number were made in the factories of Massachusetts alone. Boston, Brockton, Lynn, and Haverhill, Mass., closely grouped cities, constitute a great center of the industry (Fig. 93).

Note

There has, however, been a considerable development of shoe manufacture in the Middle West. Shoes are high-class and rather bulky freight, and take a high freight rate. With the development of a large market in the central and western states it became profitable to assemble leather and to make shoes near this market. St. Louis is the principal shoe-manufacturing center of this region and one of the most important in the country.

Other Manufactures of Leather.—Next to the manufacture of shoes, the harness and saddlery industry uses the most leather and yields products of the greatest total value. This is, by comparison, a typically decentralized industry. The majority of the harness shops are small. No complicated or expensive machinery is required, the products are bulky, are sold principally in the rural districts, and the industry tends to remain close to the markets.

In the leather glove and mitten industry the value of the products is but 4 per cent of the value of the boots and shoes manufactured. Yet the industry is remarkably concentrated, 60 per cent of all the factories being in New York State, mainly in the neighboring cities of Gloversville and Johnstown, where it was established by a settlement of Scotch glove makers and where craftsmen skilled in this trade are now concentrated.

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CHAPTER XII

FUEL AND POWER

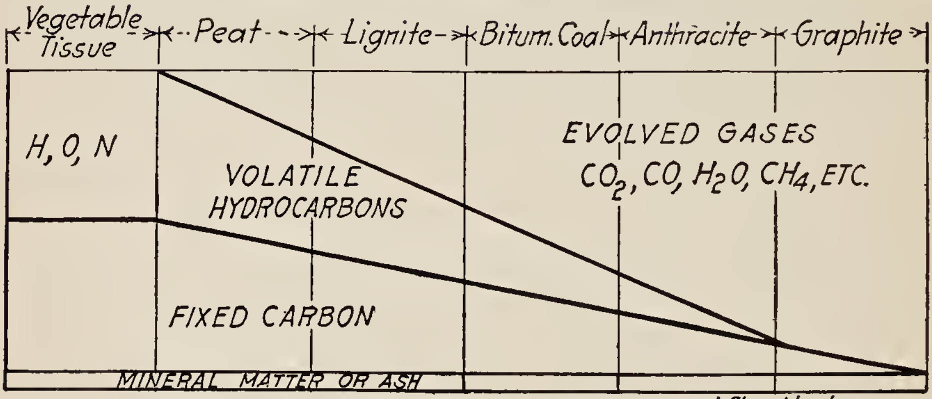
Fuel and Power Vital to Modern Industry.—It is impossible to picture the paralysis of industry and the suffering which would afflict the industrial nations of the world if the abundant supplies of fuel and power, to which their national economies are adjusted, were to be cut off. Several modern industrial nations have from two to four times as many people as could be supported from the land of those countries by agriculture alone. Large parts of these excess populations live by working in factories, on railways and ships, or at other non-agricultural pursuits. Yet most of the occupations which they follow could not exist if it were not for fuel and power. Not only would those who work in factories suffer, but all others as well. So much of our clothing and food, and so many of our utensils are made in factories by the use of power that it is as if we had many servants in our employ to do these things for us. So long has this been true that the majority of people do not know the arts of spinning, weaving, tanning, shoemaking, cabinet making, blacksmithing and other crafts by means of which each small community formerly supplied its own needs. It may be said, therefore, that industrial nations exist in large measure upon a basis of coal, petroleum, and water power, the chief sources of fuel and power—the vital elements in modern industry.

The Coal of North America

The Distribution of Coal Related to Its Geologic Origin.—Coal is preserved vegetation. It is known that there are many rock formations in North America of an age earlier than the appearance upon earth of abundant vegetation capable of forming coal. Consequently there are large areas in which it cannot be expected that coal will ever be found. Such are the rocks of the Laurentian Upland and some of the older Paleozoic sediments.

When abundant vegetation did appear upon the earth it did not collect uniformly for the formation of future coal deposits. Certain favorable conditions of geography, in addition to abundant vegetation, seem to have been necessary; one of which was the existence of large areas of swamp land created by the encroachment of shallow seas upon the continent. The location of these ancient swamps determined the position of the great coal fields, while the recurrence of such conditions in geologic history has given coals of differing age and characteristics (Fig. 94). There are in North America deposits which are representative of nearly every stage in the process of coal formation; peat, lignite or brown coal, bituminous coals from low to high grade, and anthracite. The character of coal has been much influenced also by subsequent events in its geologic history.

Anthracite Coal Regions.—The series of geologic events required to transform the accumulations of ancient swamps and bogs into anthracite coal was not completed in most of the American coal regions. The anthracite districts are therefore of limited extent (see small crosses in Fig. 96). The total quantity of anthracite coal mined in North America averages less than one-sixth of the total coal production of the continent. The only important anthracite field lies in the highly folded rocks of northeastern Pennsylvania, where an area of only 480 square miles contains practically all of the known reserves of this excellent coal. Due to the complicated structure of the rocks, deep mining is in part necessary, involving heavy expenditures for labor and machinery (Fig. 95*B*).



After Newberry

Fig. 94.—Showing the changes which occur in the composition of vegetable tissue in its transformation through various stages in coal formation.

Most of the commercial output of anthracite is used in the northeastern states. Smaller quantities move westward by rail or to the Great Lakes ports and are carried by boats to the upper lakes region where the coal is used as domestic fuel. The quantity of anthracite remaining underground is not large, and at the present rate of mining anthracite will soon be so scarce that its price will be prohibitive to the average consumer.

Vast Reserves of Bituminous and Lower Grade Coals.—North America, and particularly the United States, is fortunate in its possession of vast reserves of coal for the future. The total quantity of bituminous coal in North America is estimated at about 2,250,000 million tons, of which nearly nine-tenths is in the United States. This is so vast a quantity that if all of it could be utilized it would supply the entire world, at its present rate of consumption, for more than a thousand years. No other continent except Asia has reserves of bituminous coal estimated at half this amount.

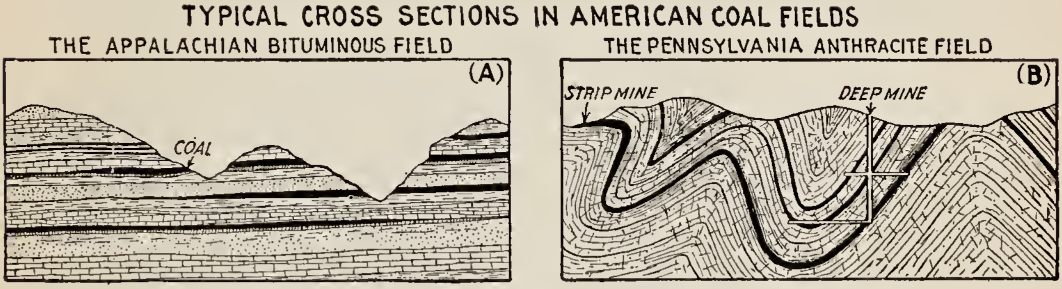

TYPICAL CROSS SECTIONS IN AMERICAN COAL FIELDS
THE APPALACHIAN BITUMINOUS FIELD
(A)
COAL
THE PENNSYLVANIA ANTHRACITE FIELD
(B)
STRIP MINE
DEEP MINE

FIG. 95.—*A.* Nearly horizontal coal beds in the dissected Allegheny plateau. *B.* Highly folded coal beds in the Appalachian region.

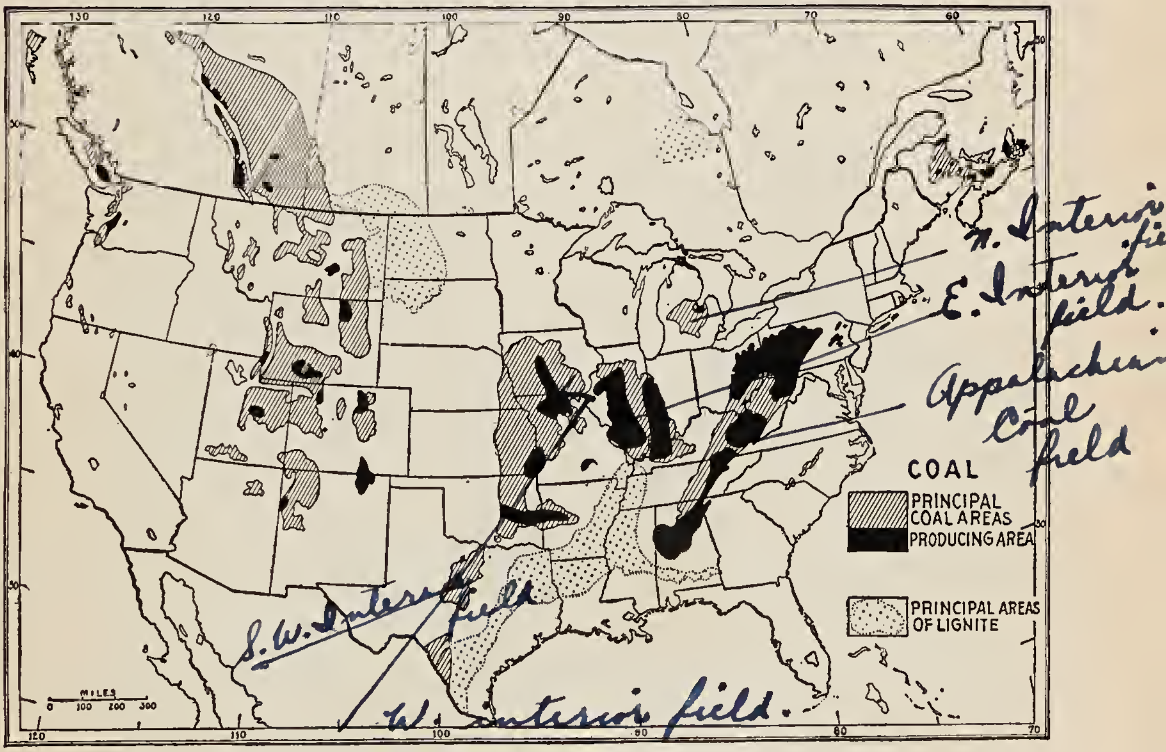

130
120
110
100
90
80
70
60
COAL
PRINCIPAL COAL AREAS
PRODUCING AREA
PRINCIPAL AREAS OF LIGNITE
MILES
0 100 200 300
N. Interior field
E. Interior field.
Appalachian Coal field
S.W. Interior field
W. Interior field.

FIG. 96.—The principal coal fields of the United States and Canada.

In addition, North America has even larger reserves of soft brown coal, or lignite, estimated at nearly 2,700,000 million tons, of which more than a third is in Canada. The brown coals have lower heating value than bituminous coal, deteriorate rapidly when exposed to the air, cannot be shipped far, and are now used only near the place of mining. They constitute, however, a source of potential power for a future time

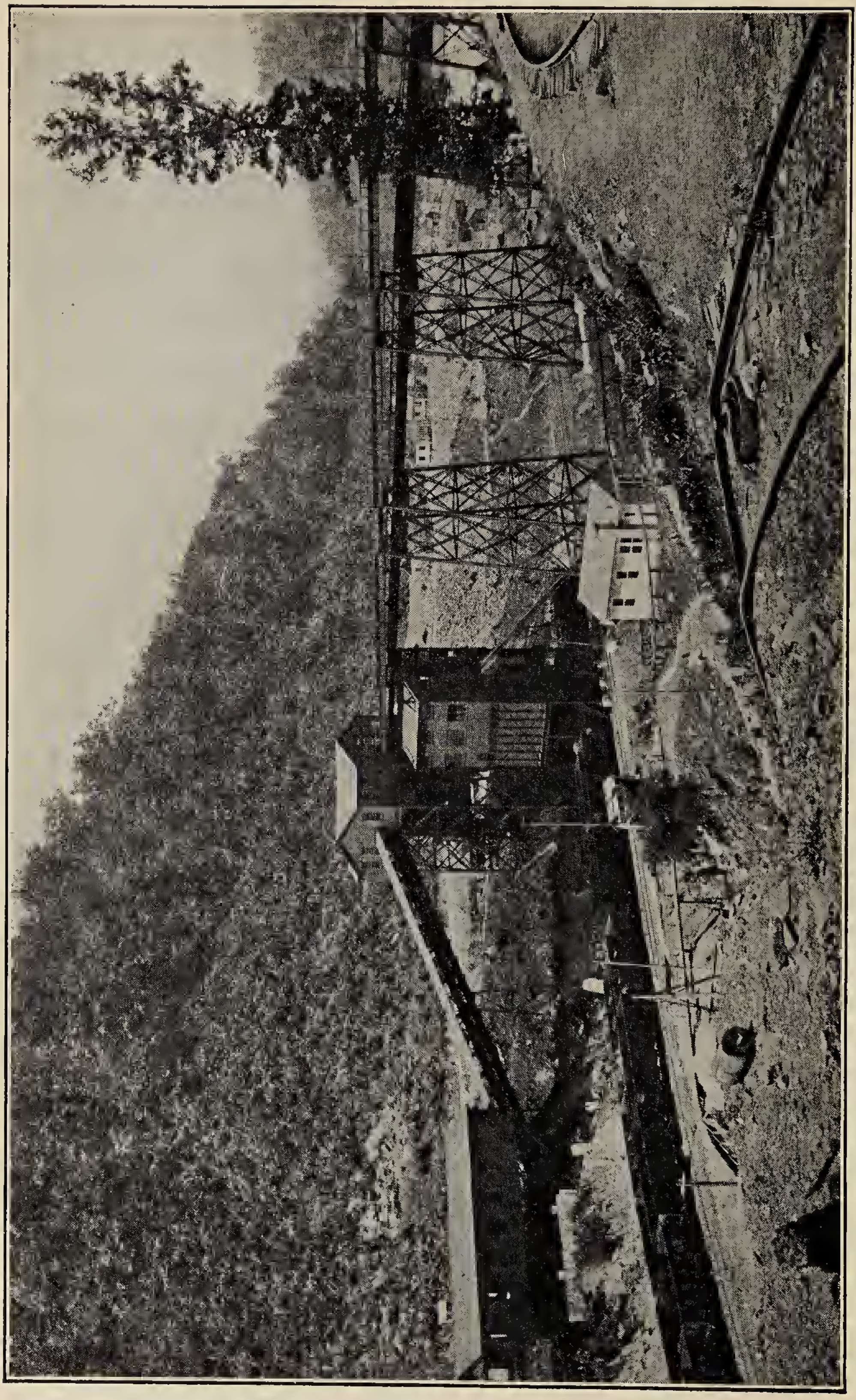


FIG. 97.—A typical valley in the Appalachian coal field. The mine mouth is on the valley side at the right. Coal is conveyed in mine cars over the trestle and is discharged through the tipple into railway cars. (*U. S. Bur. Mines*).

when they shall be more needed than they are now and when means for their economical utilization shall be better developed.

The Appalachian Coal Field.—The location, extent, and general character of the North American coal regions are shown in Figure 96. Of these various regions that which is known as the Appalachian field is most important, not only because of its great extent and because of great present output, but also because of the high quality of its coal. The region extends from northern Pennsylvania to Alabama, mainly through the dissected Allegheny-Cumberland Palteau. Its favorable geographic location and the ease with which the coal can be mined have contributed much to its importance. The process of uplift which formed the plateau deformed the strata but little and the alternating beds of coal and of rock deposited in the ancient swamps still lie in a nearly horizontal position. Subsequently streams have carved their valleys deeply into these layers exposing the coal beds along the valley sides. Incidentally, it is probable that this long-continued stream erosion has removed much more of the original coal than remains (Fig. 95*A*).

exten
outpu
high
qualit

It is obvious that horizontal beds of coal exposed on hillsides present a comparatively simple mining problem. New mines can easily be opened. Coal brought to the mine mouth can be dumped into railway cars in the valley below (Fig. 97). So advantageous is this situation that, with the aid of modern mining devices, even the expensive labor of America can produce coal more cheaply that it can be mined in England. (This remarkable ease of mining coal has, however, led to at least one serious misfortune, namely, the opening of too many small mines, and to competition which frequently results in overproduction followed by a congestion of transportation, enforced idleness of workmen, and labor difficulties.

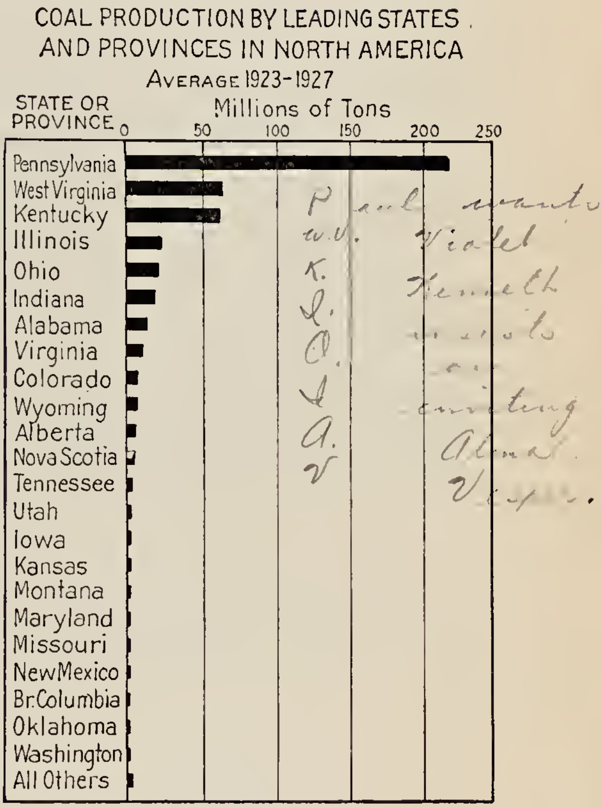


Fig. 98.

The geographical location of the Appalachian coal region is also highly fortunate from the commercial viewpoint. Its northern and most productive section (Fig. 98) lies within easy reach of Great Lakes transportation, while throughout its length, rivers and valley roadways opening east and west form routes of transportation. Coal from Ohio, Pennsylvania, and West Virginia constitutes the principal return cargo for the Great Lakes freight boats which move iron ore eastward. The coal is stored at the upper lake ports during the summer for use during the winter when the lakes are closed by ice. The central and northern Appalachian coal regions, particularly, are the principal source of the high-grade bituminous coals required in the manufacture of coke, which is essential in the iron smelting industries.

Interior Coal Fields.—Four bituminous coal fields of great importance are situated in the interior plains of North America. In the order of their present importance they are (1) the eastern interior field in Illinois, Indiana, and Kentucky; (2) the western interior field in Iowa, Missouri, Kansas, and Oklahoma; (3) the southwestern interior field of Texas; and (4) the northern interior field of Michigan. The eastern field produces the most and the best coal of the interior region. It competes with Appalachian coal for the industrial markets of the Great Lakes region. The coals of the western and southwestern fields are of lower grade and are used principally as railway fuel and for local needs. Only a small quantity of this coal moves far from the place of its production. Very little of the Michigan coal is being mined because better grades of coal are readily secured from other fields.

Rocky Mountain and Pacific Coast Fields.—At various points in the Rocky Mountains, in the Puget Sound region of the United States and Canada, and in Alaska are scattered fields of bituminous coal. The total output of these fields is small but the coal has a great local importance because of the distance which separates these regions from the eastern coal fields. The Puget Sound fields, especially of Canada, constitute the only important source of steamship coal on the Pacific Coast.

Coal an Industrial Raw Material.—The principal use of coal in America is as a source of power; next comes its use as fuel for heating homes and in certain industrial processes which require heat. It is also an important raw material in some widely distributed industries, particularly the manufacture of coke and illuminating gas. In the Appalachian coal region where coke is made in large quantities for blast furnace use, the by-product of coke manufacture are of great value. When properly treated a ton (2,000 pounds) of coal will yield 1,425 pounds of coke, 10,500 cubic feet of gas, 7.1 gallons of tar, 2.4 gallons of a crude oil, and 19 pounds of sulphate of ammonia.[1] Tar and sulphate of ammonia are raw materials of importance in the chemical industries. In the past, crude methods of coke manufacture have wasted nearly all of these valuable by-products and much is still being wasted (Fig. 99). Connellsville, Pa., is the center of coke making in America, and the

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[1] World Atlas of Commercial Geology, U. S. Geol. Survey, pt. I, p. 9.

Note.

presence here of superior coking coal was the chief reason for the growth of the great iron and steel industries in the Pittsburgh district.

The Use and Conservation of American Coal.—The abundance of American coal and the relative ease with which it is obtained have invited wasteful methods in its exploitation and use. Figure 100 shows the rapid rate of increase in the production of coal in the United States, which now mines about 40 per cent of the annual coal supply of the world.

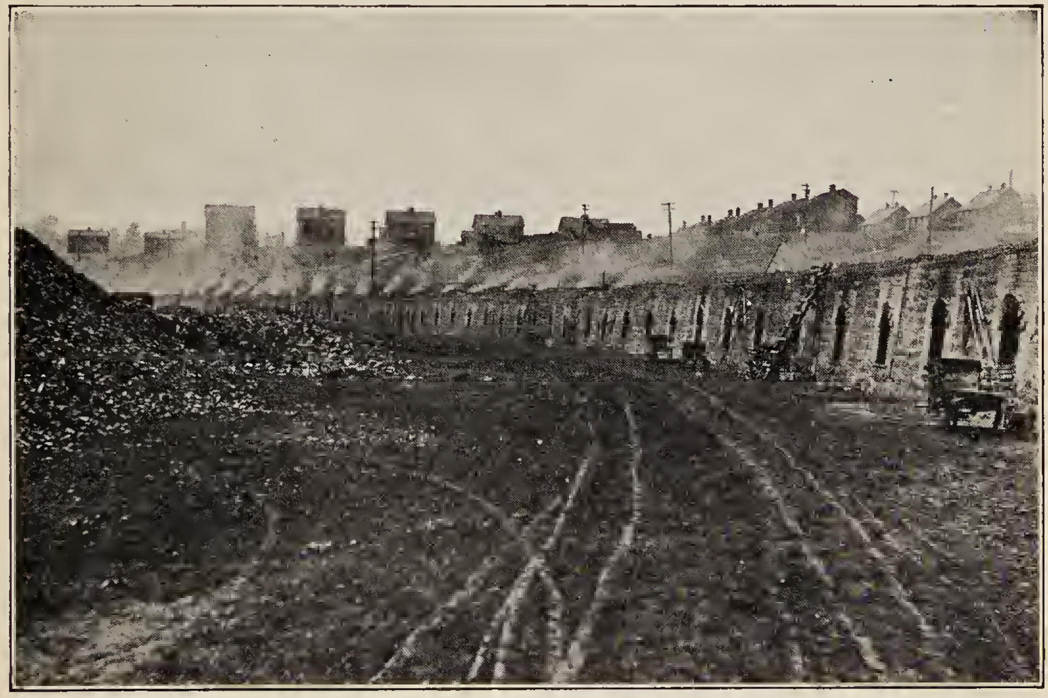

Fig. 99.—Bee-hive coke ovens in the Connellsville region. The fumes from these ovens carry away the many valuable by-products recoverable by modern processes. (*U. S. Bur. Mines*).

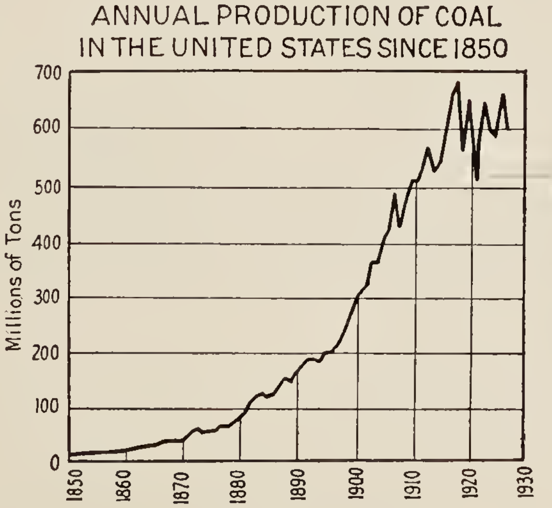

Fig. 100.

[illegible]
to presence
of other sources
of power.

Coal constitutes over a third of the railroad tonnage of the United States,[1] and the problems involved in the distribution of so large a quantity to its markets are extremely difficult to solve. In coal mining it is possible, by proper methods, to secure nearly all of the coal, yet the abundance of coal and the highly competitive mining conditions in the United States encourage the mining of the best and most accessible coal, often rendering thinner layers unavailable for the future, and, on the average, leaving about a third of the coal in the ground. The movement for the conservation of coal in America should be directed toward the correction of wasteful practices and particularly toward insuring a proper distribution and use of coal. The vast reserves available make an actual

Yet

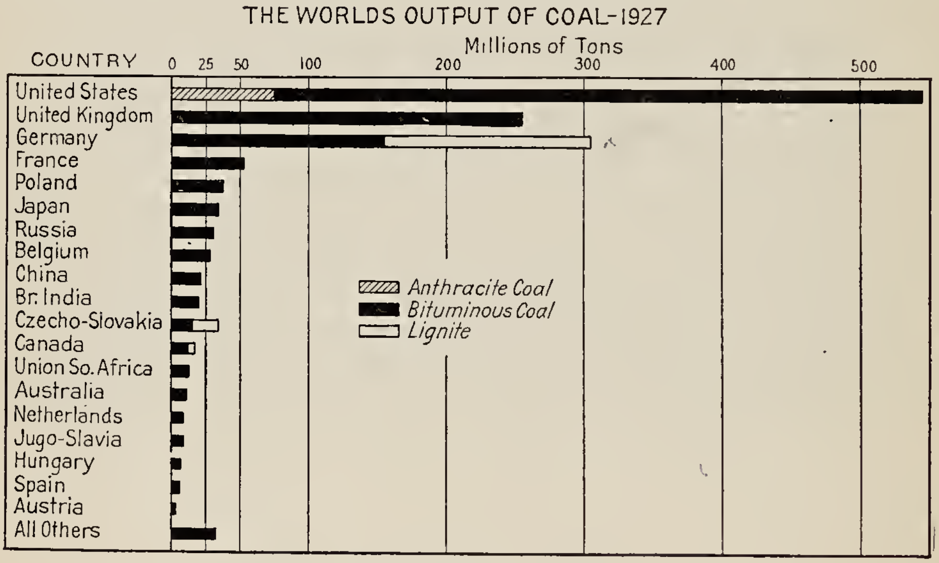

FIG. 101.

reduction in the quantity of coal consumed unnecessary and probably undesirable, if so large a quantity can be used efficiently. It may be assumed with reasonable safety that the future will see more efficient methods of coal utilization and probably also new means of fuel and power production as outgrowths of existing industries dependent upon coal. Such a hope is, however, not an excuse for the waste of a necessary and exhaustible resource.

Foreign Trade in American Coal.—A large part of the world has not coal enough to run its necessary industries and move its trains (Fig. 101), and these regions depend on imported coal. In the past America has not had a large share in this foreign trade in coal. Relatively small amounts (less than 5 per cent of the average annual production) constitute the normal coal exports of the United States. Great Britain, the principal source of export coal, may find it necessary to husband her supply and the coal of America may be, in the not far distant future, the principal available supply. There can be no question about the abundance of American coal, yet the United States is not well situated to engage in this trade. The total export trade of the country is already more bulky and requires more ship space than all of the commodities imported. Many ships must now return to American ports empty. If coal is added to the export trade still more ships will be required and the freight rates charged on coal must help to pay for empty space in returning ships. American coal in most foreign regions will, therefore, be expensive. At present, nearly half of the total United States export trade in coal is from the Appalachian field into the coalless industrial section of Ontario, Canada, to which it can move by rail and lake steamer.

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[1] LEITH, C. K. Economic Aspects of Geology, p. 115.

PETROLEUM IN NORTH AMERICA

Nature and Uses of Petroleum.—Crude petroleum is a complex substance of varying chemical and physical properties. As recently as 1850 petroleum had few known uses and little commercial importance. Since that time it has sprung into a place of importance, second only to that of coal as a source of power, and its possession is now a matter of greater international concern than is the possession of coal.

The importance of petroleum lies in its compactness, the ease with which it is handled, and the directness with which it can be converted into mechanical power, and also in the many other uses to which the crude oil or its distillates may be put. Along with the other sources of fuel and power, petroleum has in a few decades contributed wonderfully to man's effectiveness and to the overcoming of his geographical handicaps. As a source of illumination it lengthens his day and as a source of automobile, railway, and ship fuel it shortens his geographic distances. Above all, as a source of lubricants it is indispensable to the operation of all types of modern machinery which lighten the labor and increase the efficiency of human hands.

The Origin and Occurrence of Petroleum.—Petroleum is believed to be the greatly altered product of minute forms of plant and animal life trapped in some of the sediments laid down in ancient seas. In the process of its formation, the oil and its associated products moved sideward or upward under pressure and much of it escaped. However, where geologic conditions were favorable, oil and gas were imprisoned in porous rock underneath subterranean domes or other favorable structures of impervious rock. From these buried pockets or reservoirs of differing size, petroleum is obtained by drilling through the impervious capping rock beneath which the oil is confined. Ordinarily gas is encountered in the upper part of the dome, then oil, underlain by water. Under the pressure of ground water or of the gas some oil wells "gush" or flow continuously for a time and then require pumping. Others require pumping from the first. Eventually the oil-bearing rock is drained and further pumping yields only water, or so little oil as to be unprofitable. It is believed that about half of the oil in the average "pool" remains in the rock and is not recovered. Improved methods of recovery may in the future make some of this oil in the depleted fields available.

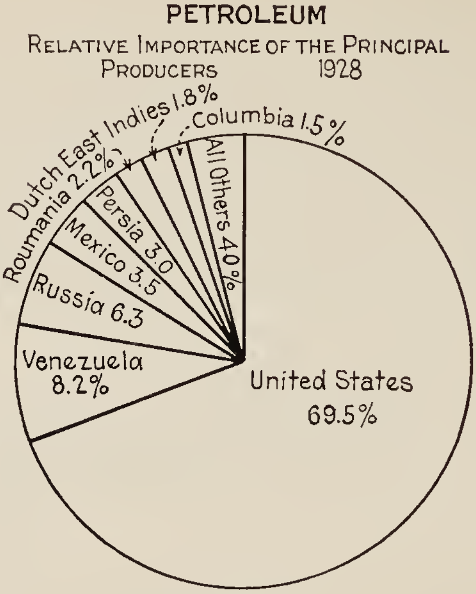
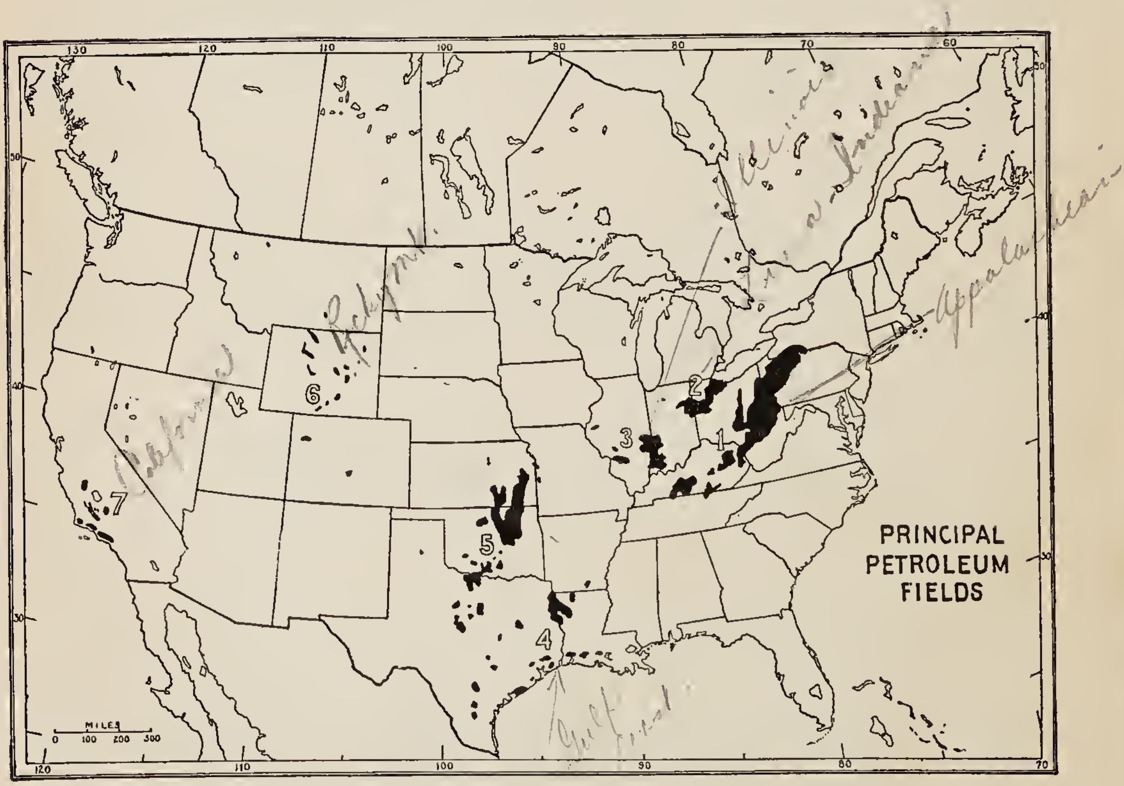


FIG. 102.


130
120
110
100
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70
60
50
40
30
1
2
3
4
5
6
7
PRINCIPAL PETROLEUM FIELDS
MILES
0 100 200 300
California
Rocky Mt.
Illinois
Lima-Indiana
Appalachian
Gulf Coast

FIG. 103.—The principal petroleum fields of the United States and Canada.

2/3 of the world's supply of [illegible]

America the Great Source of Oil.—The United States is the source of about two-thirds of the world's supply of petroleum (Fig. 102), but unfortunately, this dominance does not appear to be guaranteed for the future. Already nearly half of the estimated supplies have been exploited and the remaining portion is believed to constitute no more than one-sixth of the world's total reserves. The oil of the United States has come from a large number of localities which may, however, be grouped into seven main producing fields, shown in Figure 103.

The Principal American Oil Fields.—The first of the oil fields to be exploited was the easternmost. It lies in the same geographical area as the Appalachian coal field, by which name it also is known. Farther west lie the Lima-Indiana, the Illinois, Mid-Continent, Gulf Coast, Rocky Mountain, and California fields. The present relative importance of these several fields is indicated by Figure 104.

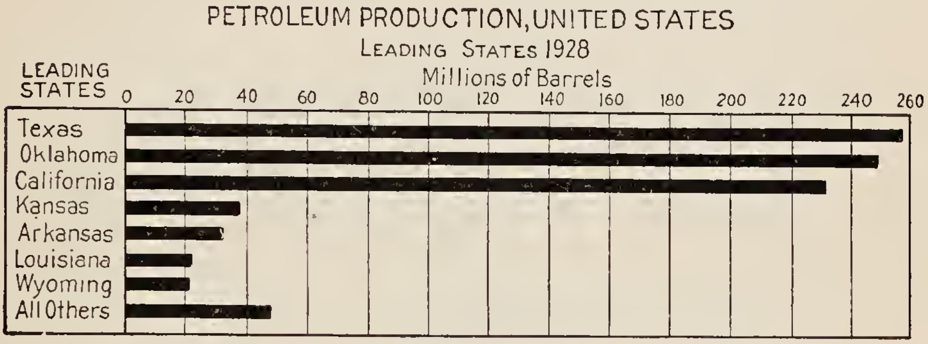


Fig. 104.

Total quantity of oil produced is, however, not the sole measure of the relative importance of an oil field; the quality of the oil produced is also a factor. In general, the oils of the eastern fields, particularly the Appalachian, yield a higher proportion of gasoline and light oils than do those of the Gulf Coast and California. The former also yield paraffin as the end product of their distillation, while the latter yield asphalt.

Transportation and Refining of Petroleum.—Some crude petroleum is burned in the form that it comes from the well for the production of power and for other purposes. A still larger part of the total, however, is refined, or broken up by distillation, and treated for the removal of sulphur and other impurities. The exact nature of this process depends in part upon the character of the oil and in part upon the market demand. The total number of petroleum refineries in the United States is large (300 to 400). The greater number of them are small establishments of 1,000 to 10,000 barrels, daily capacity, and are of the the type known as "skimming stations," which distill off the gasoline and kerosene and sell

in and near the oil-fields.

Impl. [illegible] refining

the residue as fuel oil. Such plants are found in or near the oil fields. They spring up as new pools are opened and close down where the older wells have ceased to produce. The plants which practice complete refining are fewer in number and generally are larger in size (average daily capacity over 20,000 barrels, the largest having a capacity of 180,000 barrels). Such plants are permanent in character and are located at points to which oil from large fields or producing regions may easily be piped, or located close to large consuming markets or exporting points. Great refineries of this type are found at Bayonne, N. J., and at other points adjacent to New York City, Philadelphia, Chicago, San Francisco, and on the Gulf Coast.

The crude oil used by the refineries frequently requires transportation over hundreds of miles. The liquid nature of the material has, however, aided greatly in the solution of this transportation problem. Pipe lines with numerous pumping stations along the route tap the storage tanks near the oil wells and convey the products of many wells to refining centers at a very low cost as compared with transportation by rail. The main lines of this vast network of pipes are shown in Figure 105.

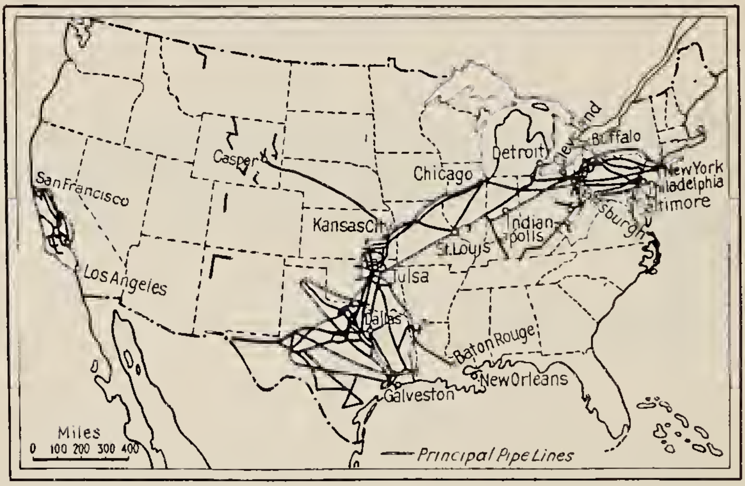

San Francisco
Los Angeles
Casper
Kansas City
Tulsa
Dallas
Galveston
Baton Rouge
New Orleans
St. Louis
Indianapolis
Chicago
Detroit
Cleveland
Buffalo
Pittsburgh
New York
Philadelphia
Baltimore
Miles
0 100 200 300 400
Principal Pipe Lines

Fig. 105.—The principal pipe-line systems of the United States.

oil pumped thru pipes.

American Foreign Trade in Petroleum.—Although two-thirds of the world's petroleum is produced in the United States, the amount is not enough for home and export requirements. The United States has about 77 per cent of the automobiles and motor trucks in the world, and in no other country is so much petroleum used in ships, locomotives, engines, and heating plants of all types. Imported petroleum, mainly from Mexico and Venezuela, now constitutes about one-twelfth of the total American supply. Exports of petroleum and its products from the United States consist mainly of the heavy oils and gasoline and total nearly twice as much as the quantity imported. They have reached an

about 1/12 of total American supply of Petroleum aggregate value of half a billion dollars in a single year and are important items in the export trade of the United States to nearly every corner of the world.

Natural gas is found in many oil-producing regions and to some extent in closely adjacent districts which do not yield oil. It is a preferred fuel in the homes and industries of the regions where it occurs because of its cleanliness and convenience, and by liquifying processes it is made to add more than 10 per cent to the gasoline supply of the country. (The commercial natural gas used annually in the United States is valued at an amount more than half that of the output of anthracite coal.) Yet this represents but a small part of the original gas resource, half of which has been wasted in connection with the opening of new oil wells. Natural gas is of principal commercial importance in the upper Ohio Valley and in Oklahoma.

Oil Shales.—Even with improved methods and greater economy in the production and use of American petroleum the estimated reserves can not last many decades. A supplementary source of oil is known to exist in extensive beds of oil-bearing shale rock which have been discovered principally in the Rocky Mountain region of both the United States and Canada, as well as in other parts of the world. Methods for recovering oil from such shales are known and practiced somewhat in Europe but they are too expensive to compete with petroleum at its present price in America. The oil shales are therefore a potential source of oil for future use, the amount of which may far exceed the original American petroleum supply.

Source of future power.

Petroleum Substitutes.—The use of petroleum and its products has brought into existence and made a vital necessity of the internal combustion engine which requires a liquid or gaseous fuel. The principal petroleum-using nations are manifesting anxiety regarding the future, and many minds are busy with the problem of substitutes. Already experiments have proved the feasibility of using as fuel the by-products of coal distillation and alcohol, if only they can be produced cheaply and in sufficient quantities. Alcohol could be obtained from the products of temperate and tropical agriculture, and probably without serious restriction of the world's food-producing areas. Since, however, it is the product of agriculture, it is not likely that it can be produced for prices which will allow it to compete with petroleum products so long as petroleum is abundant.

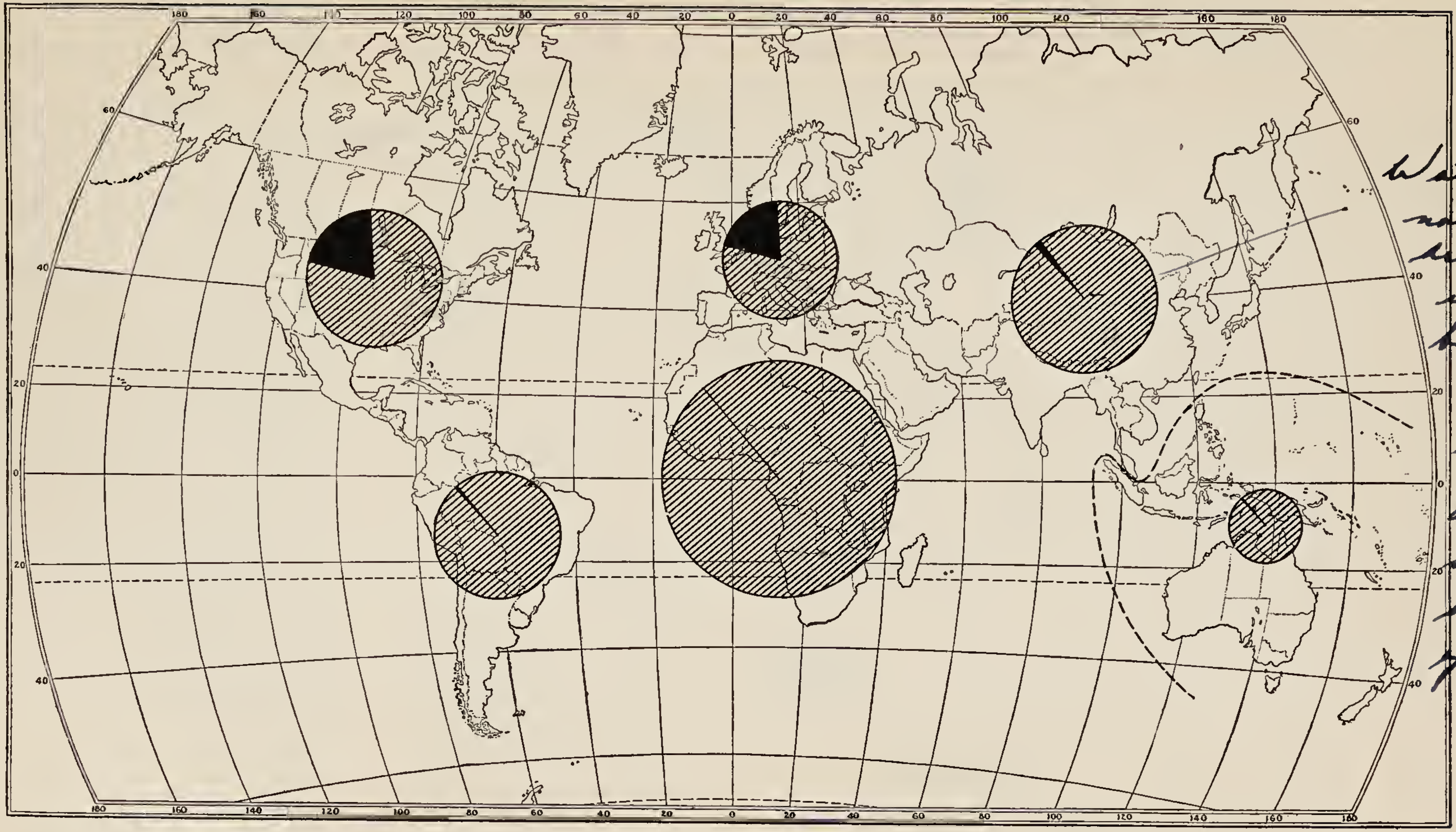
(Up to the present no means has been devised for turning vegetable oils into satisfactory substitutes for petroleum products in the lubrication of high-speed machinery) That problem may perhaps be left with some confidence to the ingenuity of the future chemist. At all events the uncertainty of the future in regard to supplies of both fuels and lubricants is ample reason for the practice of economy and of the most improved methods in the production of petroleum; and also in the manufacture and use of its products.

THE WATER POWERS OF NORTH AMERICA

Natural Environment in Relation to the Development of Water Power. Water power is a natural resource of large present value and of even greater possibilities for the future. Unlike coal and petroleum, it is not a wasting resource, but is constantly renewed by nature. Fortunately, the water-power resources of the world are better distributed than either its coal or its petroleum, for most countries have some water power capable of development (Fig. 106). Yet great potential water powers depend on favorable conditions of environment which include (1) abundant precipitation; (2) fairly uniform discharge of water through streams, resulting from (a) uniformly distributed precipitation, or (b) regulation of stream flow through natural lakes, forested watersheds, or artificial storage behind dams; and (3) a slope or gradient which permits the water of a stream to be used and reused for power development. An ideal physical situation for a great water power is found at such a place as Niagara Falls, where a large river, the drainage of a large region of abundant and fairly well-distributed rainfall, has its volume regulated by natural storage in a series of great lakes and then plunges abruptly over a vertical cliff of great height. Few water-power sites are so ideal in all of their physical aspects; many require expensive improvements by man to make up for their natural shortcomings. Yet there are in the United States water powers, capable of development, which would more than meet the present total power requirements of the country if they could be efficiently utilized.

Geographic Limitations of Water Power.—Before the day of steam, water power was the principal source of industrial power. Many industrial cities of America, such as Minneapolis, Minn., and Lawrence, Mass., owe their locations to the influence of water power on their early industries, but as industries multiplied, the water powers of these localities were outgrown; new industries used steam power because the advantages of central location often outweighed the advantages to be gained by seeking new water-power sites elsewhere. The water power could not be moved.

The development and improvement of hydroelectric power has introduced a large measure of elasticity into the utilization of water power. The factory which desires to use water power need no longer be located on the site of the power plant. Yet even the most modern improvements have failed to free water powers entirely from this disadvantage of fixed location. Mechanical appliances now make possible the transportation of electric power over long distances. However, the financial investments in long transmission lines are large and the cost of line maintenance is high. The rates which must therefore be charged


180
160
140
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80
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60
40
20
0
20
40

FIG. 106.—The waterpower resources of the world. The areas of the circles are proportional to the total future horsepower of the continents. The black segments indicate the per cent of the total power now developed. (*Data from U. S. Geol. Survey*).

Water power
not
developed
in Asia
because
of lack
of lakes
and
seasonal
distribution
of rainfall

for electric power increase rapidly with distance, and it cannot now compete with cheap coal where the length of the transmission line exceeds 300 to 400 miles. Many of the best water-power sites of North America are much more than that distance from any place at which raw materials and labor could be assembled for the economical utilization of the power. The distribution which is now a handicap to the development of water power may some day be an advantage, for it will be noted from a comparison of Figures 107 and 96 that the greatest potential water powers are in regions which are not well provided with coal.

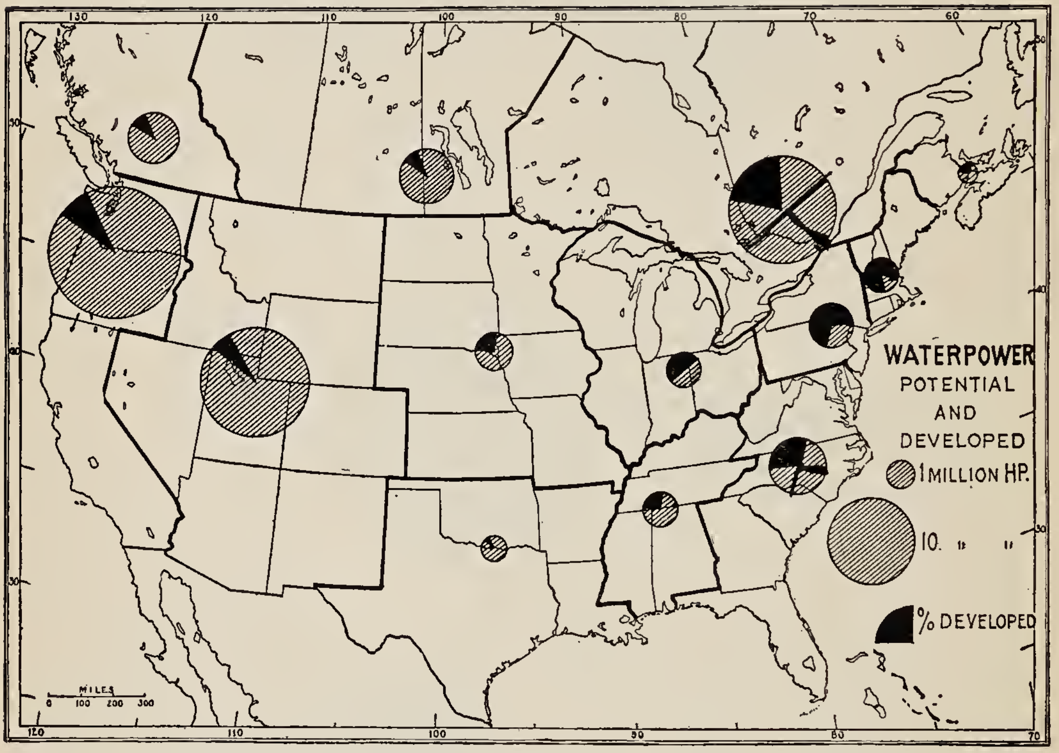

FIG. 107.—The largest water powers of the United States and Canada are in eastern Canada and western United States; regions with small resources of coal. Circles represent total water-power resources of districts within the heavy boundary lines. (*Data from U. S. Geol. Survey*).

The Developed Water Power of North America.—In the competition between cheap coal and water power in America the low cost of installing steam plants has given coal the advantage. It is, therefore, principally the best, the most accessible, and the most cheaply developed water powers that have been utilized. This is evidenced by the fact that the political divisions having the greatest developed water powers are Ontario and the state of New York, which share the vast resources of Niagara. Indeed, these are the only political divisions, except Quebec and California, having more than a million developed horsepower. Quebec with its many lake-born rivers flowing southward from the glaciated surface of the Laurentian Upland and descending abruptly into the

St. Lawrence Valley, has about as much developed power as Ontario. It will be observed from Figure 107 that other regions of great importance are (1) New England, where uniformly distributed precipitation, many lakes, falls, and rapids, due to glacially disturbed drainage, and absence of coal have encouraged the use of water power, (2) the states of the South Atlantic group, which share the advantages of the heavy rainfall and the steep slopes of the southern Appalachians and of the "fall line," and (3) the Rocky Mountain and Pacific Coast regions, where the use of water powers, some of them the adjuncts of irrigation projects, has been encouraged by the expensiveness of coal.

The Uses of American Water Power.—Water power is particularly adapted to the use of industries which do not, like smelting or brickmaking, require heat as well as power. The principal industries using water power are, in the order of their importance, transportation, paper and pulp mills, textile manufacturing, flour and grist mills, and lumber manufacture.

Undeveloped Water Powers of North America.—It is estimated that the water-power resources of the United States are, without storage, about 50 million horsepower, and those of Canada about 20 millions of horsepower. These figures total more than six times the amount of water power now developed, and exceed the total amount of stationary power of all types in use in the two countries. It is believed, moreover, that if reservoirs were constructed and other means were used to store and completely utilize the surface waters that the water powers of the United States might reach 200 million horsepower. Figure 107 indicates that a large part, more than half, of the undeveloped power of the continent lies in the Cordilleran region of the West and Northwest, where heavy rainfall and perennial snows feed mountain streams which descend to the ocean by steep gradients. This fact is significant in connection with the readjustments in the geographic distribution of industry which may result from a more complete utilization of hydroelectric power in the future.

The Power Problem in America

Waste Characterizes the Use of Power in America.—Nature has endowed North America and particularly the United States with abundant fuel and power resources, yet an acute problem exists with respect to this wealth. Its very abundance has led to production at a rapid rate and by careless methods. Means of transportation and proper utilization have not kept pace with production. The result is waste of material and waste of effort. *Waste of material,* (1) in production, through failure to recover all of the coal and oil which might be obtained, and through fire and loss of vast quantities of gas into the air; (2) in transportation, through inefficient storage and careless handling; (3)

production
transportation
manufacture
use

p, t, m, u

in manufacture, through failure to recover valuable by-products in coke manufacture and in certain types of oil refining; and (4) in use, through inefficient firing of boilers, the use of inefficient engines, and the use of unrefined petroleum and of natural gas for purposes better served by other things. *Waste of effort*, (1) through the effects of unrestricted competition, and (2) through unnecessary transportation of materials.

A Solution of the Power Problem Must Be Found.—The conditions upon which the solution of the American power problem rests are principally governmental and economic. Yet geographic factors, including the location of the principal sources of power with respect to raw materials and markets are of vital importance. The problem is extremely complicated and even the direction in which the solution is to be sought can hardly be foretold. Suggestions have been made for bringing together vast amounts of coal and water power in the form of electric energy to be distributed over the great industrial region of northeastern United States. This proposal for a "super power zone" has many advantages, particularly those of saving in transportation on coal turned into electric energy at the mine mouth and in the greater cleanliness of industrial centers. The inertia of established methods of power production and the necessity for revised legislation will, however, retard these desirable reforms, even though they might result in a saving to the nation of many millions of dollars per year.

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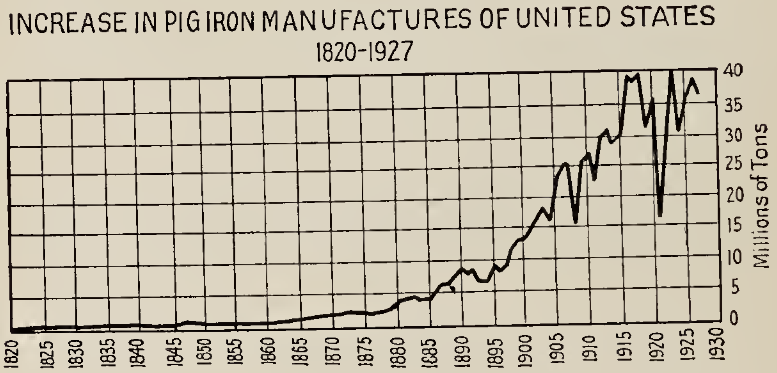
CHAPTER XIII

THE IRON AND STEEL INDUSTRIES

Iron in Nature.—Iron is one of the most abundant elements of the earth's crust, but it is very rarely found in a pure state in nature. Only three elements—oxygen, silicon, and aluminum—are more abundant. On an average, iron forms about 4½ per cent of the earth's surface rocks. It occurs in upwards of 100 different minerals, but four of these supply practically all the iron that is used; they are hematite, magnetite, limonite, and siderite, Hematite is by far the most important, both because the richest and most abundant deposits of the world are hematite, and because the metallic iron is more easily separated from this ore than from the others. The percentage of iron in these four ores ranges from about 48 in pure siderite to 70 in hematite, and 72 in magnetite. In the United States little iron ore containing less than 50 per cent of iron is being smelted, but in Europe lower grade ores are commonly used. Iron, in the form of oxides, is found almost everywhere in the crust of the earth, giving the yellow, brown, and red colors to soils and to weathering rocks; but only here and there has the iron been sufficiently concentrated to make the ore worth mining and smelting. Ores frequently contain sufficient sulphur or phosphorus or both to injure them, but special processes of treating such ores have been devised and are successful in removing these injurious substances.

Iron in the Past.—Many of the tribal or racial groups that made up the early human family passed through the stone age and the bronze age into the iron age. Though iron is more common in the rocks than copper and tin, of which bronze is made, it seems anciently to have been less highly esteemed than bronze, or perhaps was more difficult to work into usable shapes. The great nations of antiquity used relatively little iron, and this mainly for weapons and tools. In the civilization of the Greeks, Romans, and medieval Europeans, iron played only a minor part, and as late as 1740, the yearly iron consumption of Europe is estimated to have been only about 2 pounds per capita. One corporation in the United States now markets more iron and steel yearly than all the world used in any year prior to 1880.

The Modern Importance of Iron and Steel.—As indicated above, the use of iron on a large scale came in the last half-century (Fig. 108), but in that half-century most momentous changes have occurred. The world is now virtually dominated by the steel-making and steel-using peoples. At the present time the greatness of a nation is measured largely by its power to marshal tremendous material resources—ships, guns, locomotives, machinery and munitions. Whether in peace, with its struggles for commercial domination, or in war with its life-and-death struggle for military victory, success depends much upon a nation's ability to mine and transport more coal and iron, to manufacture more and better machines of construction and destruction, and to use these machines more efficiently than its competitors can. In war, man power counts; morale and generalship count; but they must be backed up by millions of tons of steel, and no nation can long hold a place of leadership in the modern world that has not command of adequate iron resources. It is a grim and terrible development, this steel-shod, steel-armed, and steel-armored type of civilization, and it is to be hoped that it may be replaced by a better type before it completes its own ruin.



INCREASE IN PIG IRON MANUFACTURES OF UNITED STATES
1820-1927

Fig. 108.

The unique position of iron among the metals lies in the wide range of properties that can be imparted to it by various treatments and by alloying it with small amounts of certain other metals. The great strength, rigidity, and hardness that may be given to steel; the elasticity, magnetism, and keen edge that may be imparted; the special properties of strength, temper, and cutting power, even when red hot, which can be given to steel by alloying it with other elements, all combine to qualify iron for an endless variety of purposes. It is well understood that the development of machinery, by which human efficiency has been greatly multiplied, depends mainly upon iron and coal in the hands of enlightened and energetic peoples.

Geographical Aspects of Iron Smelting.—The iron in iron ores is combined with one or more other elements, and is mixed with various earthly materials called "gangue," from which it is separated by the process of smelting. The modern blast furnace is essentially a huge tower into the top of which coke, limestone and iron ore are dumped (Fig. 109). The limestone serves as a flux, fusing with the gangue and releasing the metallic iron which, in liquid form, flows to the bottom of the furnace,

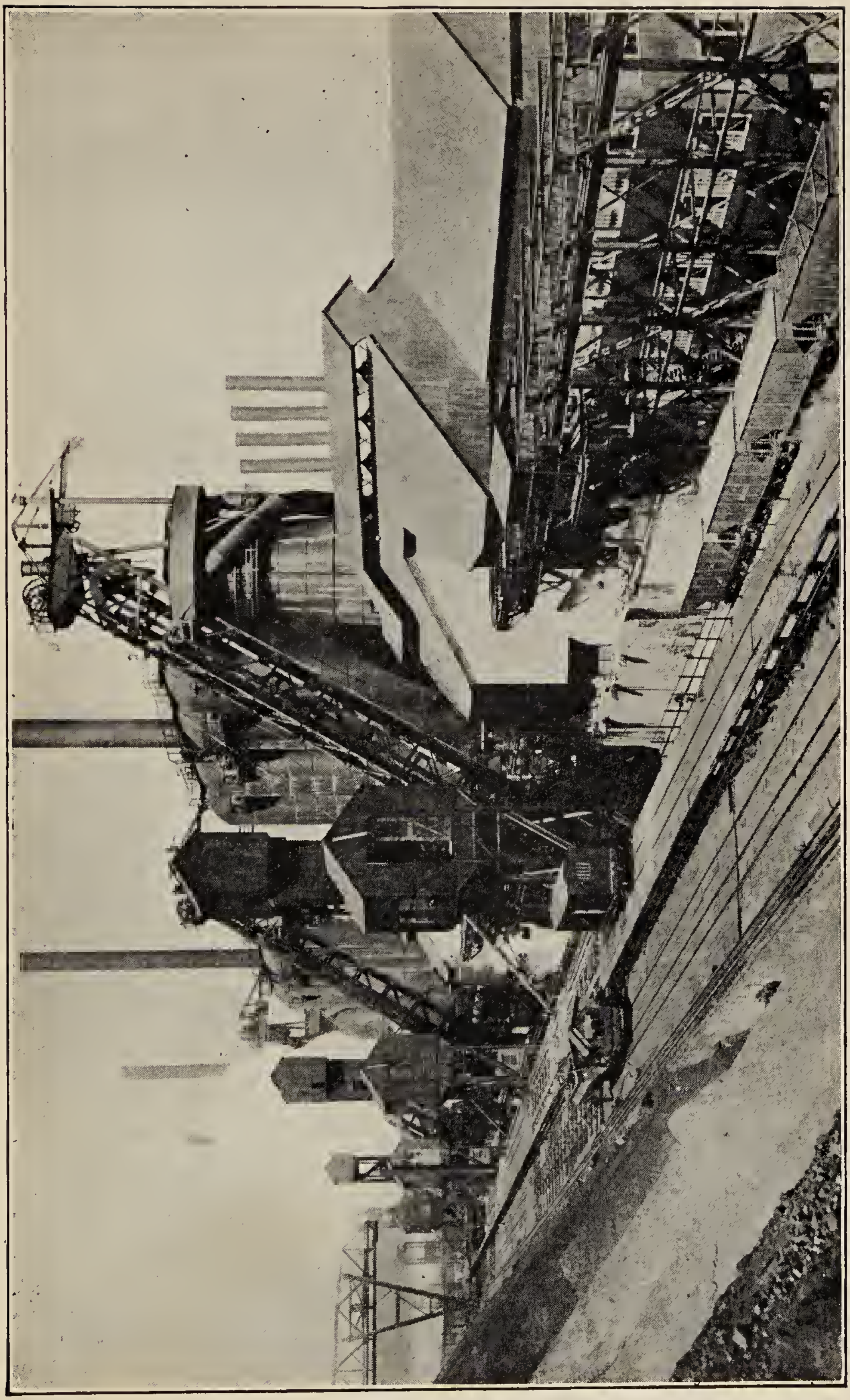
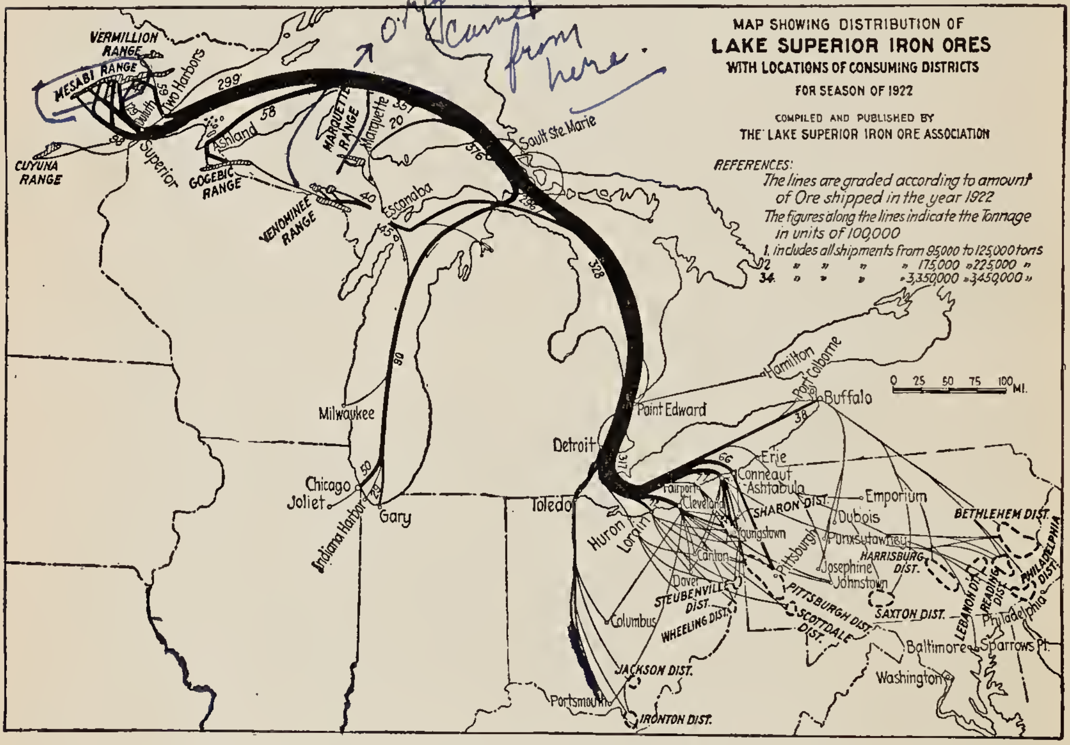


FIG. 109.—A modern iron-smelting plant. The stock pile of ore may be seen at the left, and above it the traveling crane used in loading the small cars which move up the inclines to charge the furnaces. (*Courtesy of the Iron Trade Review, Cleveland, Ohio.*)

and is drawn out from time to time and cast into pig iron or is further treated to make steel. The intense heat necessary is provided by the combustion of the coke which burns in a furious blast of heated air forced into the bottom of the furnace.

In the production of 1,000 tons of iron from the ore, about 1,000 tons of coke are required, and from 500 to 1,000 tons of limestone. If the ore contains 55 per cent of metallic iron, the production of 1,000 tons of pig iron would require 1,800 tons of ore, 1,000 tons of coke, and say 700 tons of limestone, or 3,500 tons in all. Since the United States produces about 40 million tons of pig iron a year, using approximately 140 million


MAP SHOWING DISTRIBUTION OF
LAKE SUPERIOR IRON ORES
WITH LOCATIONS OF CONSUMING DISTRICTS
FOR SEASON OF 1922
COMPILED AND PUBLISHED BY
THE LAKE SUPERIOR IRON ORE ASSOCIATION
REFERENCES:
The lines are graded according to amount of Ore shipped in the year 1922
The figures along the lines indicate the Tonnage in units of 100,000
1. includes all shipments from 95,000 to 125,000 tons
2 " " " " 175,000 " 225,000 "
34 " " " " 3,350,000 " 3,450,000 "
0 25 50 75 100 MI.
VERMILLION RANGE
MESABI RANGE
CUYUNA RANGE
GOGEBIC RANGE
MENOMINEE RANGE
MARQUETTE RANGE
Duluth
Two Harbors
Superior
Ashland
Marquette
Escanaba
Sault Ste Marie
Milwaukee
Chicago
Joliet
Indiana Harbor
Gary
Detroit
Toledo
Point Edward
Hamilton
Port Colborne
Buffalo
Erie
Conneaut
Ashtabula
Fairport
Cleveland
Huron
Lorain
Youngstown
Canton
Dover
Columbus
Portsmouth
Pittsburgh
Emporium
Dubois
Punxsutawney
Josephine
Johnstown
Baltimore
Washington
Sparrows Pt.
Philadelphia
SHARON DIST.
STEUBENVILLE DIST.
WHEELING DIST.
JACKSON DIST.
IRONTON DIST.
PITTSBURGH DIST.
SCOTTDALE DIST.
SAXTON DIST.
HARRISBURG DIST.
LEBANON DIST.
READING DIST.
PHILADELPHIA DIST.
BETHLEHEM DIST.
299
65
129
98
58
357
20
376
40
45
296
328
90
50
79
317
38
66
77
72

Originally came from here.

Fig. 110.—Iron ores move from the mines to the smelting centers mainly by way of the Great Lakes.

tons of ore, coke, and limestone, it is evident that an enormous weight of these crude, heavy substances must be transported to the smelting centers. The economical assembling of these materials is therefore one of the biggest problems of the iron and steel industry. It is essential that two or more of the three materials—coke, ore, and limestone—be found in the same section of country, and if possible in the same neighborhood, if the iron is to be cheaply produced. Since limestone is found in many parts of the country, the problem becomes: (1) shall the iron ore be taken to the coal, or (2) shall the coal be taken to the ore?

It happens that our best coke is made from Connellsville coal in western Pennsylvania, while our chief source of iron ore is near Lake

Superior, a thousand miles away (Fig. 110). Between these two regions, the Great Lakes form a waterway which permits the ore and coke to be brought together at low cost (page 212). Since the largest demand for steel is in the populous manufacturing region between Chicago and the Atlantic Coast, the ore should move to smelting centers in that section of the country. These centers are mostly on the shores of Lake Michigan and Lake Erie, or in the great steel-making belt that extends from Ohio eastward through Pittsburgh and lesser centers in Pennsylvania (Fig. 111). On the whole, the most advantageous places for the meeting of the ore and the coke are points on the shores of Lake Michigan and Lake Erie. The Pittsburgh district remains the largest single steel center of the country because of its early start and the nearness of the Connellsville coal; but Chicago, Gary, Cleveland, Buffalo, and Duluth—all on the Lakes are taking an increasing proportion of the steel business. These lakeshore points afford the greatest number of economies of transportation, and these economies are exceedingly important ones in this industry.

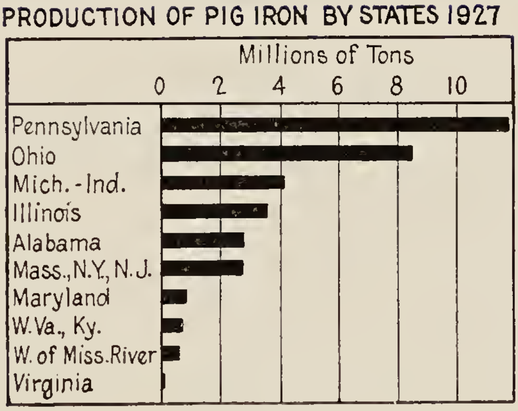


Fig. 111.

Another of the major iron-working centers is at Birmingham, Ala., where iron ore, coal, and limestone all are found in the same valley.

Location of the Principal Iron Ores of North America.—As previously mentioned the leading iron ore region of the United States (and of the world) is near Lake Superior, with the principal mines in Minnesota and in the northern peninsula of Michigan (Fig. 110). About 100 miles north of Duluth is the Mesabi iron range from which the ore is mined by powerful steam shovels working in open pits. Here high grade ore lies near the surface, covered only by glacial drift. In Minnesota also are two other ranges of less importance than the Mesabi (Fig. 113). In the northern peninsula of Michigan are several ranges, two of which extend into Wisconsin. The Mesabi range is the greatest producer of iron ore in existence, yielding annually about 55 per cent of all that is mined in the United States, and one-fourth of all that is mined in the N.B.

world. (1) The great abundance of ore in the Mesabi range, (2) its high proportion of metallic iron, (3) the remarkable cheapness with which it is mined, and (4) the cheapness with which the Lake Superior ores are transported on the Great Lakes all combine to make the Mesabi range of paramount importance in our iron and steel industries. (The Lake Superior mines supply about 80 per cent of the iron ore mined annually in the United States) Alabama (Birmingham district) supplies about 10 per cent, and New York, Pennsylvania, Colorado and several other states small amounts (Fig. 112).

Note

The Dominion of Canada is lacking in known iron ore deposits of high grade, and produces a mere fraction of its own needs. Newfoundland, however, has iron ore reserves among the largest in the world, although the present production is not large, and the percentage of iron in the ores averages only about 50. (The lack of iron ore and coal in the provinces of Ontario and Quebec, which contain the greater part of the population and industries of Canada, is a serious handicap which is met by large importation from the United States.)

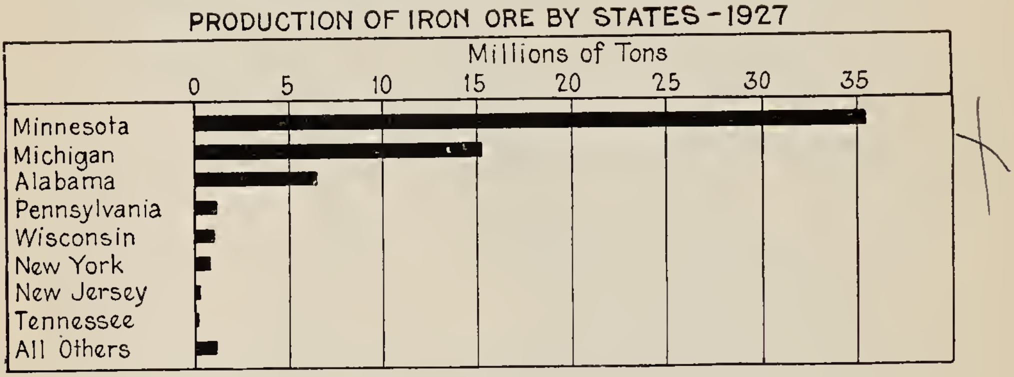


FIG. 112.—The Lake Superior region dominates the iron ore production of North America.

Importation of Iron Ores into the United States.—It seems strange that a country that has vast stores of iron ore of its own should import ore, yet the United States imports it from a number of foreign countries, mainly from Cuba and Chile but occasionally from Newfoundland, Sweden, Spain, and Morocco. The ores are used by the smelters on or near the Atlantic Coast, and especially by one at Sparrows Point, Md., built at the water's edge to utilize these imported ores.

The Manufacture of Steel.—(At present a major part of the iron produced is transformed into steel.) Cast iron is brittle, but it is employed for certain purposes where great strength or toughness is not required. Wrought iron or malleable iron is somewhat softer and can be bent, twisted, and otherwise worked without breaking. (But steel of many varieties is now the most generally used form or alloy of iron, for steel is essentially an alloy composed of iron and carbon)

steel - iron + carbon

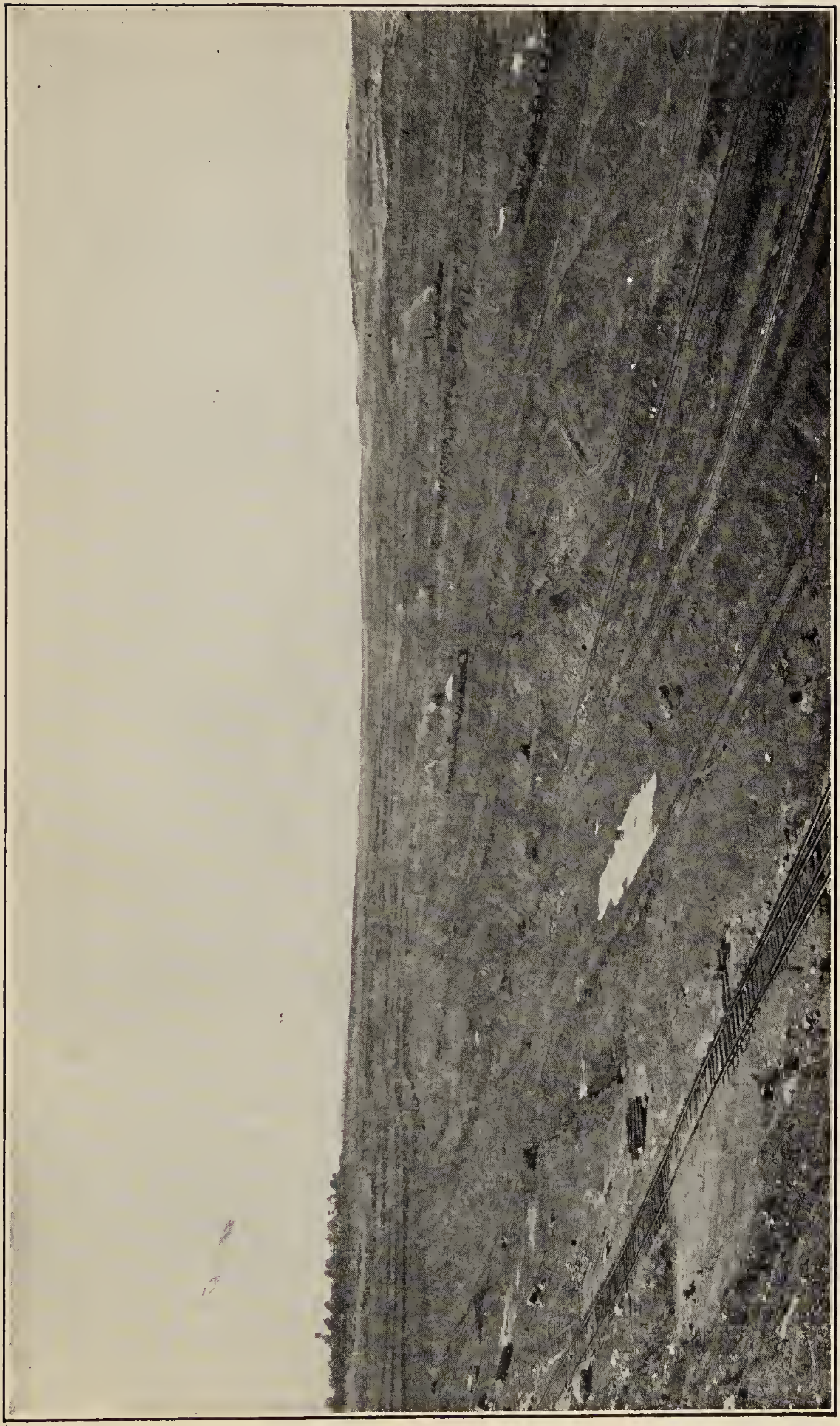


FIG. 113.—One of the open-pit iron mines of the Mesabi Range, Minnesota. The apparent size of the steam shovels, the locomotives and ore trains in the middle distance is an indication of the size of the pit. (*U. S. Bureau of Mines*).

By the Bessemer process, which came into use in the middle of the last century, the making of steel rapidly, cheaply, and in great quantities became possible, and one of the most far-reaching revolutions in industry was effected. In the Bessemer process a blast of air is forced into a huge "converter" containing liquid iron, and undesirable substances in the iron are thus oxidized or burned out. Afterward, the requisite amount of carbon is added to convert the iron into steel. A great deal of iron ore contains between 1 and 2 per cent of phosphorous, and this ore cannot be used in making steel by the Bessemer process. To utilize these ores and also to make a somewhat higher grade of steel, the "open-hearth" process has been perfected. By this slower method the undesired substances in the liquid iron are burned out by causing a flame to play over the surface of the molten metal. A later modification combines features of the Bessemer and open hearth processes; and the electric furnace provides a still more refined but more costly method of steel-making. About 85 per cent of the steel made in the United States is now made by the open-hearth process.

It has been found that by the addition of small quantities of such elements as nickel, chromium, molybdenum, titanium, vanadium, and tungsten, steel may be given new or intensified properties that make it far tougher, stronger, harder, more elastic, or more resistant to wear or to corrosion. For example, rails made of steel which contains titanium have been found to be three times as long-lived as rails of ordinary steel. The principal alloy steels are made in electric furnaces and are among the most important forward steps in the metallurgy of iron. The metal manganese in some of its alloys is essential in making steel by either the Bessemer or open-hearth processes. About 14 pounds of manganese are required for each ton of steel.

Geographical Aspects of Steel Manufacturing.—The molten iron that flows from the smelter may be cast into pig iron or it may be converted directly into steel. In the latter case the smelting process and the steel-making processes go on in the same plant, or at least in adjacent plants. The liquid steel is run into moulds, and steel ingots weighing several tons are cast, and before cooling may be rolled into rods, bars, plates, or rails or be drawn into wire, and perhaps be cut into nails. In other cases pig iron or steel ingots are sold to other manufacturers who make various iron and steel products. The fundamental processes of smelting the ore and making the steel ingots is most economically done in plants of great size, well located with respect to sources of ore and coke. The number of such plants is therefore relatively small, and they are mostly controlled by corporations possessing great capital. A half-dozen steel companies produce upwards of 90 per cent of the raw steel made in the United States and one company, the United States Steel Corporation, with an investment of nearly 2 billion dollars makes about

40 per cent of the steel manufactured in the United States; and if we omit one or two European countries, it makes as much as all the rest of the world outside of the United States.

The primary steel industries require certain favoring geographical and other conditions for their highest success:

1. A large supply of fuel and power at the lowest possible cost. Much of this is now obtained from the by-product gas of coke ovens and smelters.

2. Efficient and cheap transportation of ore and coal; water transportation may be of great advantage, as it is in bringing ore to Lake ports and bringing coal on the Monongahela River to the Pittsburgh district.

3. An army of skilled and unskilled laborers; the latter recruited mainly from immigrants.

4. Great working capital to finance operations on the huge scale necessary to the most economical production of steel.

5. The integration of industry, which in the steel industry involves ownership by the parent company of iron mines, coal mines, coke ovens, smelting furnaces, limestone quarries, steel mills, and in some cases the ownership of steamships on the Great Lakes and on the ocean, railroads, cement plants, and any other associated industries which either supply needed materials or use the products made by the steel company.

The principal steel-making centers have already been referred to. As a state, Pennsylvania leads in steel production. This single state has between 30 and 35 per cent of the blast furnaces of the United States, and they are located in various parts of the state, although they are most concentrated in the western section (Fig. 114). Fifty years ago or more Pennsylvania was foremost in the mining of iron ore, but its production of ore is now negligible. The factors which have kept the Pittsburgh district in its place of leadership have been previously noted: (1) the superior coking coal of the Connellsville region, (2) the nearness of this district to the lower lake ports to which Lake Superior ores are cheaply brought by water, (3) the central position of Pittsburgh in the populous industrial section of the country, and (4) the tendency of great plants involving a large outlay of money to continue in places where they are once firmly established.

The region lying between Pittsburgh and Lake Erie, including especially the Mahoning Valley of Ohio, is essentially a continuation of the Pittsburgh district, showing the same general advantages of location. More recently there has been a growing tendency to locate new steel plants on the shores of the Great Lakes where the Lake Superior ores are most cheaply obtained. The great plants near Buffalo (Lackawanna), at Cleveland, Detroit, Gary, South Chicago, and Duluth are examples. (The tendency to build new steel plants farther west is an evidence of the increasing demand for steel as population and industries move westward.)

The Birmingham region of Alabama, using ore and coal mined in the immediate vicinity, is the chief steel center of the South. Colorado has iron ore and coal, and has developed a local steel industry of considerable value to the Rocky Mountain region. The Pacific Coast has neither iron ore nor coking coal in any quantity, and its steel industries are of the secondary type, using in part primary steel products sent by the Panama Canal from eastern furnaces and mills.

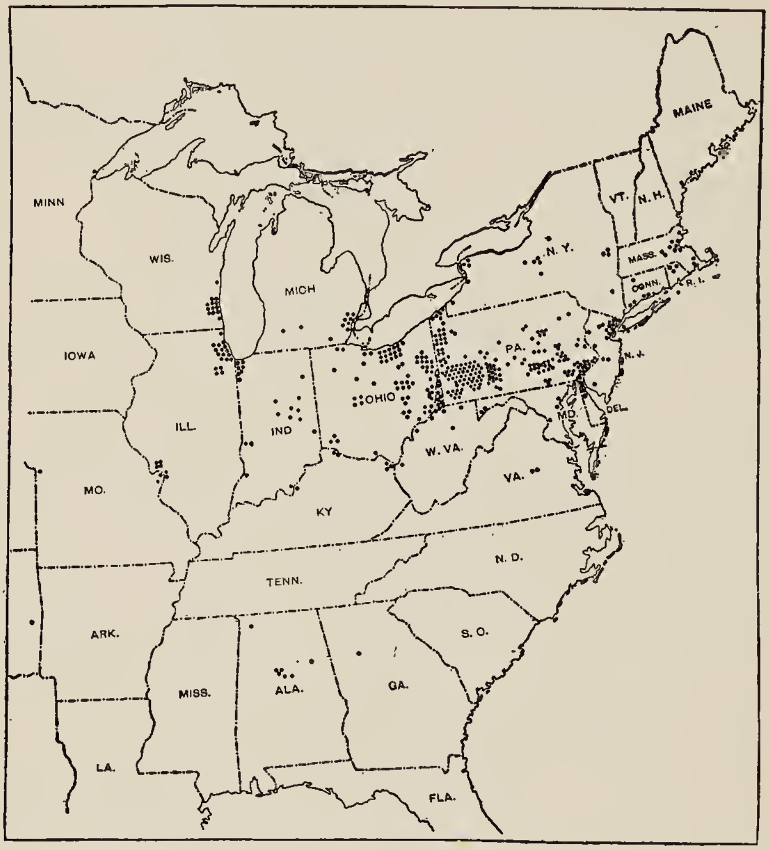


Fig. 114.—Steel works and rolling mills. Note the concentration in Pennsylvania and Ohio. (*U. S. Census.*)

Iron and Steel Industries of Canada.—The lack of iron ore in Canada and the absence of coal in the principal provinces necessarily hinders the development of steel making in that country. The ores of Newfoundland meet the coal of Nova Scotia in Nova Scotia and a considerable industry has been built up there. In Ontario, several blast furnaces operate with ore and coke mostly imported from the United States, but the annual output of pig iron for the entire Dominion is not much above a million tons annually. During the World War, the manufacture of iron and steel products in Canada increased greatly, exceeding 400 million dollars at one time, and ranking third among the various groups of manufactures of the country.

IRON AND STEEL MANUFACTURES IN THE UNITED STATES

Magnitude of the Industries.—When the many branches of the steel-making industries are taken together they make an imposing array from the standpoint of value. In the census year (1925) the value of the products of blast furnaces, foundries and rolling mills (not including vehicles or machinery) was over 6 billion dollars, or more than the value of all manufactures in the United States in 1880. The manufacture of machinery reached into the billions of dollars, as did that of vehicles. No branch of manufacturing better illustrates the American tendency and ability to organize industry on a vast scale, to integrate its various phases, and to substitute mechanical labor for manual labor. In America as nowhere else have the conditions for large-scale production been favorable, because (1) the supplies of raw materials are almost unlimited; (2) transportation facilities are excellent; (3) the rapidly growing home market, unequaled in any other country, has been able to absorb the greater part of the products at good prices; (4) the natural wealth of the country has made possible the accumulation of capital with great rapidity, (5) unprecedented opportunities have stimulated energy, inventiveness, and daring. While the above factors have operated in all our industries, they have been peculiarly influential in the steel industry, the most fundamental of all forms of manufacturing. The amount of capital now invested in the steel-making and steel-working industries exceeds the total wealth of the United States in 1850.

Regional Specialization in the Manufacture of Machinery.—Owing to the weight and bulk of steel products, it is desirable that the transportation of these products shall be reduced as much as possible. This means that the factories which use partly-finished steel for further manufacturing should locate near the chief smelting-and rolling-mill centers, which are mainly in the Pennsylvania-Great Lakes region. However, another consideration influences certain types of machine making to locate near the centers where these particular machines are chiefly used. Consequently the machinery which is mainly employed in leather making, textile making, shoe manufacturing, paper making, and other industries which are centered in the East, is itself largely though not wholly made in the East. But the region already referred to as the distinctive steel-working group of states has become the outstanding machinery-manufacturing and vehicle-manufacturing section. Ohio is the leader; holding first place in no less than 14 different and important groups of machine making industries, against 4 or 5 "firsts" for such states as Massachusetts, Connecticut, New York, or New Jersey.

Shipbuilding is, of course, controlled by a different set of influences, for ships must be built near deep water. The Middle Atlantic states include the chief shipbuilding centers, for these states are nearest the coal and iron region; their coastal waters—especially Delaware River and Bay and Chesapeake Bay—are well protected, and the winter climate permits out-door labor the year around. These advantages have caused the relative decline of shipbuilding on the New England Coast, which was our foremost shipbuilding section in the days of wooden ships.

Owing to the unprecedented demand for ships during the World War, the United States constructed new shipyards and enlarged others, and for a period of two or three years, built more ships even than Great Britain. However, it costs considerably more to build steel ships in the United States than in Great Britain. It also costs more to operate ships under American laws than under those of most European powers. Consequently shipbuilding in the United States is again at rather low ebb.

Agricultural machinery is in greatest demand in the Mississippi Valley and the chief centers of its manufacture are in five mid-western states (Illinois, Wisconsin, Indiana, Ohio, and Michigan) which make 80 per cent of the value-product of the entire country.

Automobile manufacturing has had the most phenomenal growth that any industry ever had. By 1928 some 2 billions of dollars of capital were invested in it in the United States and the factory value of the cars exceeds 3 billions of dollars a year. This may be the better appreciated when it is realized that the value of motor vehicles, tires and parts annually made in this country is now more than ten times that of the agricultural machinery made.

The automobile industry, in part, grew out of the earlier carriage and wagon industry which utilized hardwood and steel, and so was localized in the hardwood and steel-producing section of the Middle West. Michigan, and most notably Detroit, has become the leader in this industry, the state making over one-half of the automobiles made in the United States; while five middle-western states (Michigan, Ohio, Indiana, Wisconsin, and Illinois) make upwards of three-fourths of the value-product of the country. Probably nothing more impressively shows the widespread material prosperity of the American people than the use of automobiles by all classes, including working men, farmers, farm hands, salaried and professional men, and men of wealth. The United States has only about 6 per cent of the people of the world, but it has 77 per cent of the automobiles. It is well known that the recent remarkable extension of good roads in the United States is the immediate outgrowth of the widespread use of the motor vehicles.

The Manufacture of Locomotives and Cars.—This branch of the steel-using industry is closely localized in the steel-making states, especially in Pennsylvania, Illinois, Indiana, and Ohio, which states manufacture about three-fourths of the value-product of railway cars. The manufacture of locomotives remains largely in the Middle Atlantic states where the older companies with established reputations have long been located. These are notably Pennsylvania, New York and New Jersey. It is an interesting fact that the value of automobiles made annually in the United States is many times as great as that of all the locomotives and railway cars that are made.

Iron and Steel Products in the Foreign Trade of the United States.—Down to the year 1892, the United States imported more iron and steel manufactures than it exported. Since that date, the exports have rapidly expanded; from 1913 to 1928 they increased enormously, exceeding a billion dollars in several different years. This exceptional increase was largely but not wholly due to the war in Europe. In recent years the value of the iron and steel products exported by the United States has been approached only by that of foodstuffs; for example, the exports of machinery and automobiles in 1927 averaged about 3 million dollars a day. Our imports of iron and steel products are now small.

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CHAPTER XIV

MINERAL INDUSTRIES

A Variety of Minerals Necessary to Modern Industry and Trade.—The present is commonly called the age of iron and steel. While iron and steel do occupy the foreground in any picture of modern industry, their use would be very much limited if it were not for other minerals used in conjunction with them. The other essential minerals are of two fundamental classes, (1) metallic and (2) non-metallic. The former includes many semi-precious and precious metals, and the latter the rocks, earthy materials, and natural salts of industrial or chemical value.

A complete list of the minerals which are of importance to modern industry would be a long one. Only a few of the more important may be chosen as examples of the influence of geographical factors upon the location of the mineral raw materials and the distribution of manufacturing industries which use them. North America is favored in the possession of valuable deposits of most of these minerals. Their exploitation and manufacture has developed as a logical accompaniment of the iron and steel trades and of other industries, all of which result indirectly from the possession of large resources of fuel and power.

Metallic Minerals

Geologic Factors Influence Geographic Distribution.—The principal metallic minerals to be surveyed in this connection and the ores from which they are obtained are, most of them, directly or indirectly traceable to the results of igneous activity. Although the valuable minerals are often found, not in the igneous rocks, but within other rocks adjacent to areas of igneous activity, they are believed to result from hot solutions and gases associated with the origin of igneous rocks. It is therefore not remarkable that the principal deposits of the valuable metals and their ores are found in regions where igneous activity has been an important factor in geologic history, rather than in the great regions of undisturbed sedimentary rocks. This rule is, however, not without exceptions.

In general, regions of igneous activity have been regions of mountain building. This fact has also a relation to the distribution of mining industries. Associated with the mountain-building forces are the formation of veins and of other types of ore bodies redeposited from underground solutions. Moreover, the mountain-building forces have frequently elevated mineral deposits and the rapid stream erosin of mountains has served to expose them, while in level regions the minerals would have remained deeply buried had they been formed under such conditions. The ranks of the states in gold, silver, and copper production indicate to what extent the mining of precious and semi-precious metals of importance in North America is located in the mountainous sections of the continent (Figs. 116, 119, 120).

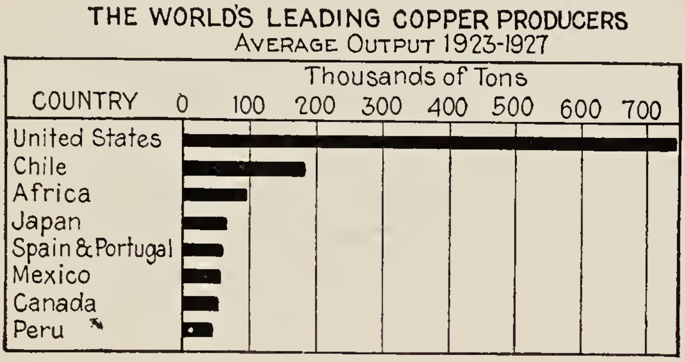

FIG. 115.

Copper Important in Ancient and Modern Industries.—The use of copper preceded the use of iron in the development of civilization. Combined with tin it made the bronze implements of ancient peoples and some copper is still employed for bronze manufacture, though brass, an alloy of copper and zinc, is of larger importance to modern industry. The use of pure copper has been greatly increased by the development of electrical machinery and electric transmission, and the electrical industry is now the largest consumer of copper.

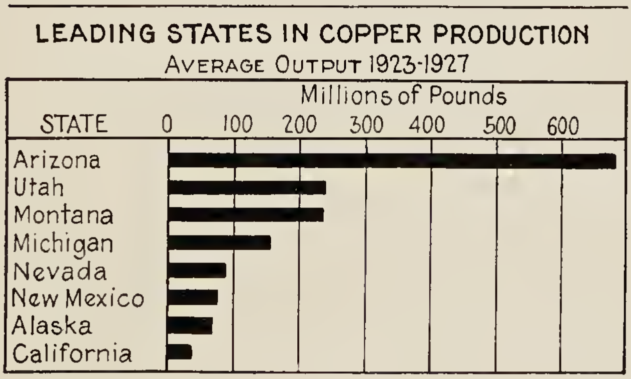

FIG. 116.

Sources of American Copper.—The United States produces more than 50 per cent of the world's copper (Fig. 115), and a relatively small quantity is obtained in Canada. The ores of copper are of various classes. In the Keweenaw Peninsula of Michigan native or metallic copper is obtained, mainly by deep and expensive mining. The greater part

Montana Utah Michigan mineral.

of the American copper supply is now obtained, however, from the ores of Arizona, Montana, and Utah. In these western mines the copper is found in chemical combination, mainly in the form of sulphides. Figure 116 shows the rank of the leading states and provinces in copper output, and the preeminence of the West is easily seen.

Copper Smelting and Refining.—The preparation of metallic copper from the Lake Superior ores requires only mechanical concentration and melting. The greater part of the American ores, however, must be concentrated and reduced from their chemical combinations by smelting. Since the average yield of copper in the United States is only about 32 pounds per ton of ore (1.6 per cent), it is clear that the concentration and smelting of the ores is most economically done near the mine. Many large mines have their own smelting plants (Fig. 117).

The product of this first step in smelting, called "copper matte," contains only 35 to 50 per cent of copper but is sufficiently concentrated to bear the cost of transportation considerable distances for the completion of the process. Further smelting produces a copper (called "blister copper") of more than 95 per cent purity, which frequently contains valuable amounts of silver and gold. This copper is refined by electrolysis and the precious metals are recovered. Most Lake Superior copper also is now refined to increase its purity and to recover silver. Electrolytic refining requires a large and expensive plant, and the average American refinery can handle the output of as many as ten large mines. (Most of the refining of copper in America is done at Atlantic seaboard points from Baltimore to New York. (These refineries are near the principal market for copper and have the added advantage of port facilities for handling South American and other foreign copper imported for refining, and for the exportation of refined copper to Europe, which is the principal foreign market.) Refineries have been established in Montana and on Puget Sound in response to a growing market for copper in the western half of the continent and to an export market in Japan.

The manufacture of copper into wire, sheets, brass, and miscellaneous articles is also concentrated principally in the North Atlantic states near the large markets for these wares.

Lead and zinc are commonly associated metals, and both have wide industrial applications. (Zinc, in the form of a galvanized coating, protects iron and steel from oxidation. It is used also in the manufacture of brass and as a substitute for lead in various appliances and in paint manufacture.) Lead is used principally in the manufacture of paint, in type metal, solder, and other alloys, in electrical and plumbing supplies, and in shot. In most mines the ores of the two metals are found together, sometimes in conjunction with silver. Yet they are unlike in general properties and uses.

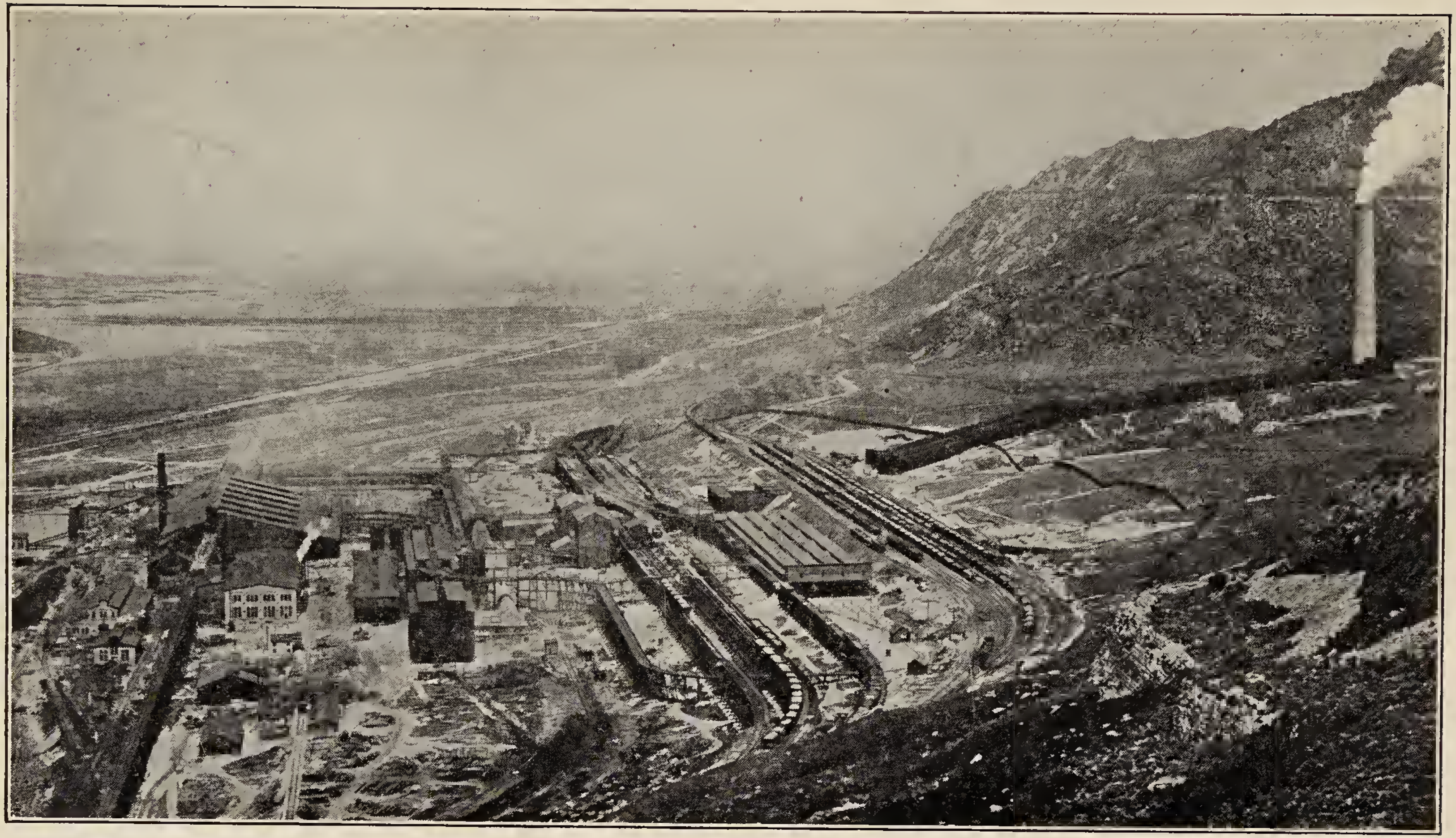

FIG. 117.—A copper smelter in the mining district of Utah. It is established in this region to be near the mines. (*U. S. Bur. Mines*).

N.B.

The lead and zinc mined in North America constitute more than one-third of the world's supply of each of these valuable metals. In the case of these metals the great interior plains of the continent contribute a considerable fraction of the total supply. The ores of this region have a somewhat different origin from those of the West, which have generally originated from igneous intrusions.

copper
combination

Nickel is an important member of a group of metals which are used principally with iron in the manufacture of steels and in other alloys having special properties. Nickel has also other uses, particularly that of plating other metals to improve their appearance and to prevent oxidation. North America is the principal source of the world's nickel. The output of the United States is negligible, but that of Canada is large. The nickel mines of the Sudbury district, north of Lake Huron, yield more than three-fourths of the present supply of the world. The Canadian ores contain nickel in chemical combination with copper, iron, sulphur, and other substances and require both smelting and refining. The smelting, as in the case of copper ores, is done mainly near the mines while the refining is done in southern Ontario, New Jersey, and in Europe nearer to the market for the nickel.

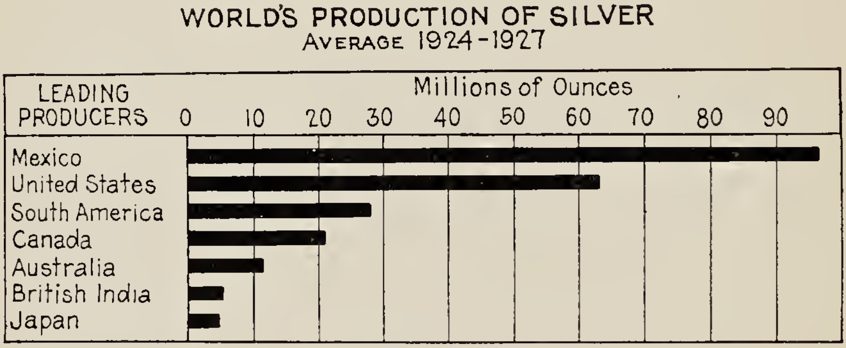

FIG. 118.

Gold and Silver.—We are accustomed to think of the world's production of the precious metals as a very important and vital industry, and so it is, for they have many essential uses. Yet the combined value of all of the gold and silver annually produced in the world would be only one-third enough to buy the average corn crop of the United States. North America is relatively a much more important figure in the production of silver than in the production of gold (Figs. 118 and 322). The United States, Alaska, and Canada yield less than one-fourth of the world's gold, but nearly half (and if the quantity produced in Mexico is added, about three-fourths) of the world's silver. Figures 119 and 120 show the general distribution of the gold- and silver-mining industry in the United States and Canada. The great importance of the Rocky Mountain region will be seen. The two metals, though commonly

N.B.

associated in the mines, occur both as metallic gold and silver and in various chemical combinations. Mining methods and methods of concentration and smelting depend upon the nature of the ores. The product of the smelter must be further purified in a refinery.

Aluminum is the most abundant of the metallic elements of the earth, exceeding even iron. It is a component of ordinary clays and shales. Unfortunately no methods have been devised for the profitable extraction of the metal from ordinary clay. The principal ore of aluminum (bauxite) is an altered rock of high aluminum content derived from the ancient weathering of certain older rocks. France, the United States, and the Guianas have the only important producing deposits of this material in the world. The principal American field is in Arkansas, with one of minor importance in Georgia.

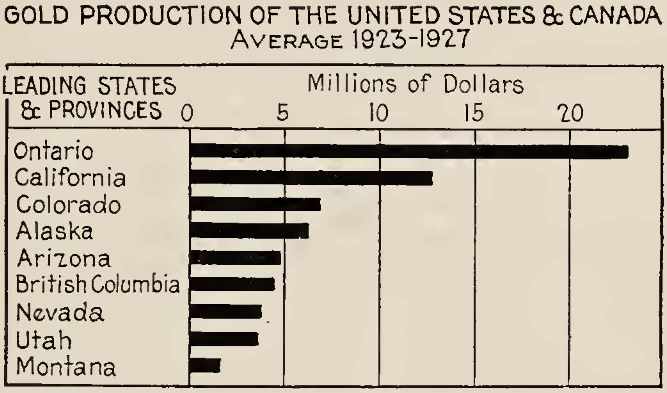

Fig. 119.

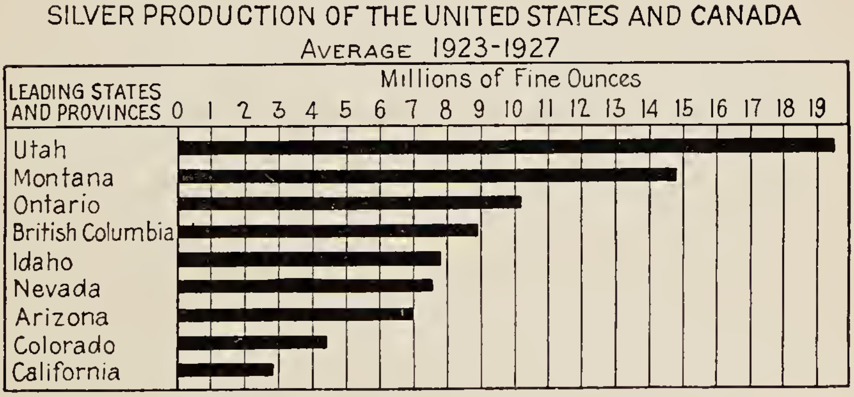

Fig. 120.

A century ago aluminum was unknown; even a quarter of a century ago but little of it was available. The present output is the result of the use of electric energy in the reduction of the ore. For this purpose cheap hydroelectric current is necessary and the bauxite, which averages a content about 25 per cent metallic aluminum, moves from the mines to distant points, first for concentration, particularly at St. Louis, and then to cheap water power for smelting. Niagara Falls is an important center of the industry, but other centers have grown up where cheap electricity is available near the eastern manufacturing districts which constitute the principal market for aluminum. One of the most interesting of these is being developed at Maryville, Tenn., adjacent to a small area having the heaviest rainfall in eastern United States, and rivers with steep gradients on forest-covered slopes of hard rock. This combination of conditions is favorable to the development of cheap hydroelectric power. Although France mines more than half of the world's bauxite, the United States and Canada manufacture more than half of the aluminum.

NON-METALLIC MINERALS

Stone and Earth Materials Widely Distributed.—Rocks, gravel, sands, and clays having economic value are found in many regions and are used locally for many different purposes. In some regions stones of exceptional beauty or quality are found and these enter into commerce and may be transported great distances. However, the majority of the non-metallic mineral substances are so heavy and so low in value that their commercial movements are limited. The total value of these materials used annually in North America amounts to many millions of dollars.

Stone.—The principal stones of economic value in the United States are limestone and granite, while marble, sandstone, and others are quarried in smaller values. The largest quantities of stone used are (1) crushed stone for concrete construction, road building, and railway ballast; (2) building stone; and (3) paving stone. Limestones are widely distributed and local supplies are usually drawn upon to provide crushed stone. The most commonly used limestone for building purposes is the widely known gray stone of the Bedford-Bloomington district of Indiana. Granite is a more common building material in the East than in the Middle West. The principal granite quarries of New England lie not far from the coast. Granite for use in the Middle West is supplied partly from quarries in central Wisconsin, in the southern Appalachian Mountains, and from the famous quarries in Vermont.

Gravel and sand constitute a resource of large importance, particularly since the coming of the era of extensive road improvement and of concrete construction. The most important supplies of these materials are found in the regions of most recent glaciation in the northern states. The water-sorted products of glacial crushing are found in local moraines, eskers, and outwash plains and are so well distributed over the area that improved roads of great length have been constructed where the maximum haul of gravel was but a very few miles. This is a geographical advantage which may be measured in terms of many millions of dollars per year. The cost of local stone crushed for road construction in Wisconsin is more than ½ glass of U. S. is made in the [illegible] W. Virginia & East Ohio. Glass sand moves to region of satisfactory and cheap fuel

about 50 per cent more per cubic yard than is that of local gravel screened and washed for similar use. This difference represents in a rough way the value of glacial crushing. The service of a geologist trained to recognize and locate such deposits is coming to be a preliminary to extensive road-improvement projects in several northern states.

Sand and the Glass Industry.—Sand is the principal raw material of the glass industry. Glass sand is obtained by crushing pure sandstones and from water-laid deposits, the latter mainly for cheap glass. Glass sands are widespread and are produced commercially in a score of American states of which the leading are Illinois, Pennsylvania, and West Virginia.

The cost of the sand is, however, but a relatively small item of expense in glassmaking. A satisfactory fuel is more important, and the glass sand generally moves to a region of cheap fuel for manufacture. Natural gas, which is a particularly desirable fuel, and the coal of the upper Ohio Valley have attracted this industry and more than half of the glass of the United States is made in western Pennsylvania, West Virginia, and eastern Ohio. The central location of this region with respect to the glass-consuming market is also an important consideration, since only one-third of the value of the glass manufactured is in the compact form of window glass, while two-thirds is pressed and blown glass, bottles, and jars, which are both bulky and fragile and take high freight rates. N.B.

Clay and Its Products.—Clay, of various grades and degrees of purity, enters into the manufacture of a large number of things, among which the more important are brick, tile, terra cotta, cement, pottery, granite ware, and paper. *Brick and tile* are heavy clay products which may be made of a variety of clays and some are made in nearly every inhabited portion of North America. Yet improvement in transportation and the increasing cost of fuel have had a notable influence in concentrating this industry also in the upper Ohio Valley. Pennsylvania and Ohio make about one-third of all of the brick and tile manufactured in the United States. The principal markets for common brick are the great cities, notably New York and Chicago, and the marketing phase of the clay working industry is particularly important in the parts of Illinois and New York State near these cities. *Pottery and porcelain* manufacture is an aspect of the clay working industry upon the location of which the source of the clay has little influence. The quantities of the high-grade clays used are relatively small and if other conditions are favorable they can profitably be imported. The critical influences affecting distribution are fuel and skilled labor. The manufacture of low-grade pottery products is established in many parts of the United States. Two large centers of high-grade pottery manufacture are (1) Trenton, N. J., established in pre-Revolutionary days, but surpassed in importance in recent years by (2) a small district in the upper Ohio Valley, comprising

Columbiana and Mahoning counties, Ohio, and Hancock County, W. Va. East Liverpool, Ohio, is the principal center. The great advantage of this region is its high-grade coal. The raw materials of both the Ohio and the New Jersey potteries are largely clay, shipped in from the southern states and even from Europe.

Cement.—New uses for Portland cement have increased its production in the United States a thousand fold in 30 years. Cement is a combination of clay and limestone which has been burned to drive off water. The raw materials used in its manufacture in various mills include clay, shale, limestone, marl, and blast furnace slag. Some combination of these materials suitable for cement manufacture is of relatively common occurrence. A source of fuel is likely to be of greater influence than the raw material in determining the location of cement manufacture. Although some cement is burned with crude oil or natural gas, more than three-fourths of the total is produced with coal as a fuel. Location with respect to market is also a factor of great importance for cement is heavy and relatively low in price and the cost of transportation adds much to its final cost. In such localities, therefore, as combine good limestone, clay or shale, abundant coal, and accessibility to a large market, cement manufacture is likely to prosper. Such a location is the Lehigh district of eastern Pennsylvania. In 1900 this region made nearly three-fourths of the cement output of the United States. With the westward expansion of cement markets, new regions such as the Ohio Valley, the Chicago district, Missouri and California, have become important cement producers, and the Lehigh Valley now makes less than one-fourth of the total.

Asbestos is the fibrous rock used in many products which require heat-resisting properties or electrical insulation. Quebec is the world's principal source of asbestos. Upon this supply the United States, which is the largest user of asbestos, is at present almost entirely dependent.

rubber

Sulphur is an essential material in many industries. In the mineral form it enters into the manufacture of rubber and into the composition of orchard sprays and of explosives. In the form of sulphuric and sulphurous acids it is the basis of many chemical industries: the preparation of phosphate fertilizer, the refining of petroleum and the manufacture of woodpulp. (The United States possesses large resources in sulphur and produces about one-half of the world's supply, some of which is exported) In the Gulf Coast region of Louisiana and Texas extensive beds of sulphur exist underground but in such surroundings that they can not be recovered by mining. (A very simple method of obtaining the sulphur has been devised, however, in which the sulphur is melted by forcing superheated steam down through pipes. The sulphur is melted by the steam and is forced to the surface by compressed air.) Much sulphur is used in the manufacture of sulphuric acid, but larger quantities of acid are made from iron sulphide (pyrite). Vast amounts of valuable sulphur-

1/2

N. B.

ous gases are wasted in the western smelters where metals are extracted from the sulphur compounds in which they occur.

Salt is a mineral of such common occurrence in America that it is difficult to realize that in some parts of the world it is obtained with difficulty. In the early history of eastern North America local sources of salt were the occasion for the establishment of several settlements.

For half a century underground deposits of salt have been worked in various parts of the continent and the total product amounts now to about 7 million tons annually, or about 125 pounds per person. Much of the salt is used in the chemical industries as well as in the preservation of meat and fish and for domestic consumption. Most of the North American salt supply is obtained (1) by evaporating the natural brines of salt lakes or springs, (2) from the artificial brines made by conducting water down to buried salt deposits and pumping it again to the surface, or (3) by mining rock salt. The principal salt-producing regions are (1) Michigan, Ohio, Ontario, and western New York, where beds of rock salt are encountered at variable depths; (2) Kansas; (3) the Gulf Coast; (4) California. There is abundant salt near the surface in several of the arid western regions but there is little market for it. The northeastern region produces about three-fourths of all the salt used in the United States.

Mineral Fertilizers.—Among the elements which enter into the composition of common soils several are essential to plant growth. Of these the most important are phosphorus, nitrogen, potassium, calcium, sulphur, silicon, carbon, hydrogen, and oxygen. Most of these are found abundantly in the soil or in the water and air contained in the soil. Only the first three may be called critical elements because phosphorus is frequently deficient in soils, and potash and nitrogen, while they may be present, are often in a chemical form in which plants are unable to utilize them. Fertilizers are supplied to make up for these deficiencies and to replace the quantities of these critical elements removed from farms in the form of crops. In some parts of North America animal manures and the straw and other plant refuse replace a large part of the fertility extracted by crop production. In regions where these are not available the deficiency is made up by commercial fertilizers, which, though they may contain slaughter house refuse and other organic material, are primarily mineral in composition.

North America has large reserves of *potash* in western saline deposits, in certain widely distributed rocks and minerals, in seaweeds and in the by-products of certain industrial processes. As yet the cost of recovering potash from these sources makes the product more expensive than that which is imported, mainly from Germany.

Nitrogen, which is the chief component of air, is not available to plants until it is combined in the soluble form of a nitrate. This process is accomplished in nature through the agency of certain bacteria which live mainly upon the roots of leguminous plants, such as beans, clover, and alfalfa. It is also accomplished chemically, to an increasing extent but at considerable cost, by means of electric heat. The industry tends, therefore, to seek localities where hydroelectric power may be obtained within reasonable distance of the fertilizer markets. Another growing source of nitrates is the sulphate of ammonia recovered in coal distillation (see p. 168). Mineral nitrates are obtained almost exclusively from the desert of northern Chile (see p. 297).

Mineral Phosphates.—Phosphorus is vital to the seed-producing function of plants and is therefore of great importance in the soil of grain-producing regions and is likely to be depleted when grain is continuously sold from the farm. Mineral phosphates enter into the composition of many commercial fertilizers.

Although North America is not now an important source of mineral potash or nitrates, it has a vast reserve of phosphate rock from which is produced nearly one-half of the world's commercial supply. The rock now utilized is obtained mainly from deposits in Florida and Tennessee. Some of the material is obtained in pebble form from river gravels. A larger amount is mined in open pits from surface rocks. Much of the best has already been exploited by very crude and inefficient methods.

There have been discovered in Wyoming, Utah, Montana, and Idaho beds of rock phosphate which constitute the greatest known reserve of this material in the world. At present it is little mined because of its great distance from the fertilizer markets. It will be very important in the future when the Middle West demands more commercial fertilizers. The metal smelters of these same states now waste large quantities of sulphuric acid which might be employed in the treatment of the rock phosphate for the manufacture of the acid phosphate, the chemical form in which it is required for agricultural use. Since there is no practicable means of recovering phosphorus from the air, the ocean, or from organic sources, as in the case of nitrogen and potash, the reserves of phosphorus should be handled with an economy which will provide for an indefinite future.

The Fertilizer Industry.—One of the important chemical industries of the United States is the manufacture of commercial fertilizers. The raw materials used in this industry include the mineral fertilizers already described, organic materials, such as bones, slaughterhouse refuse, and fish waste, together with substances used as fillers or diluting agents. These materials are obtained from both domestic and foreign sources, and are most economically assembled relatively near to the place of consumption. Figure 121 shows the expenditures for commercial fertilizers in 1919. It indicates the location of the great fertilizer market on the Atlantic Coastal Plain and the Appalachian Piedmont. Because of this market, and because of accessibility to the imported nitrates, potash, bones, the menhaden fisheries, and fish waste, as well as close proximity to the Florida phosphates, the manufacture of commercial fertilizers is established in nearly every Atlantic Coast port. The Atlantic and Gulf Coast states south of New York produce about three-fourths of the total for the country.

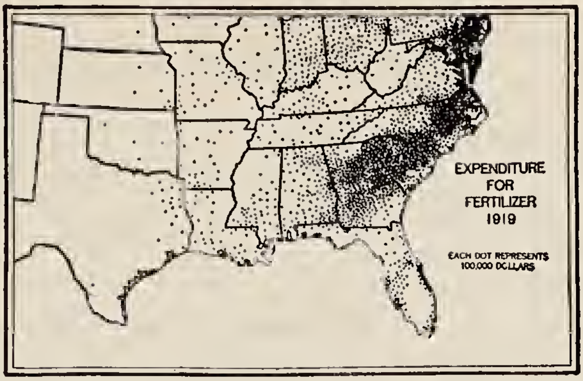
EXPENDITURE FOR FERTILIZER 1919
EACH DOT REPRESENTS 100,000 DOLLARS

Fig. 121.—The vegetable-growing and cotton-raising industries of the Atlantic coastal plain and the Appalachian piedmont are the principal consumers of commercial fertilizers (*U. S. Dept. Agr.*)

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CHAPTER XV

INLAND TRANSPORTATION

Place Utility.—Economists speak of "form utility," "time utility," and "place utility." The manufacturing processes change the *form* of materials for the purpose of making them more useful or more valuable. For example, when clay is made into bricks its value to mankind is increased. The change of form has given "form utility" to the clay and has added to its value. However, there may be little or no demand for the bricks at the place where they are manufactured, but there may be an active demand for them in certain other places. By transporting them to places where they are wanted, their actual value to society is increased, and this added value is no less real than that given by the processes of manufacture; the transporting process is referred to as giving "place utility" to the articles.

Transportation is absolutely essential in modern life, and the increasing perfection of transportation facilities is one of the chief characteristics of present civilization. An example of this may be drawn from the menu of a dinner in almost any American family. It would probably be found that twenty or more parts of the world, representing lands thousands of miles away, have contributed to the dinner. Yet the requisite transportation service is so highly organized and, on the whole, so cheap that we are scarcely conscious of its vital part in the daily routine of life. The magnitude of transportation agencies may be seen in the fact that in railroad property the United States alone has invested something over 20 billion dollars and in all other facilities for transportation on land and water the investment must be nearly as much more. This would mean an investment of nearly $2,000 in agencies of transportation for each family in the nation.

The Relation of Transportation to the Geographical Division of Labor.—Our modern economic system is based upon the practice of the division of labor, which has two main aspects. One aspect is seen in a factory where each workman performs only one kind of work; for example, in a shoe factory, as many as 50 persons perform some part in the making of a shoe. The other aspect is known as the "geographical division of labor," and it is with this that we are here concerned. By reason of differences in climate, different parts of the earth are fitted to produce certain crops—coffee, cacao, and rubber within the tropics; cotton in subtropical regions; corn in the warm temperate, and so on. Some regions have coal, or iron, or petroleum; some have abundant labor, but few raw materials; others have the reverse. In some parts of the world agricultural land is abundant in proportion to the population, and in other places such land is relatively scarce. All of these and many other differences fit one region for the production of certain things and other regions for the production of others. If each region does what it can do best, it can do it most economically. For example, tea can be grown in South Carolina and in many other parts of the world, but as a matter of fact nearly all of the world's tea is grown in the Orient largely because abundant, experienced, cheap labor is available there. In the United States wheat was once grown as a regular crop in New England, and later in states successively farther west; but now the greater part of it is raised on the plains west of the Mississippi River, and from here it is supplied to other parts of the country. In a broad sense, New England produces manufactured goods; the Central states produce wheat, corn, and meat; California produces raisins and oranges; and Wisconsin produces cheese. More and more the tendency has increased to specialize in the production of those commodities to which a region is especially well suited, and to purchase from other regions the things for whose production they are respectively best fitted.

This geographical division of labor is quite in contrast with a system such as the manorial system in England in the Middle Ages, when the manor consisted of a nearly self-sufficient community. The various classes of people who made up the community endeavored to produce all the necessary food; to raise the sheep needed for the wool for their clothing, and to spin the yarn, weave the cloth, and make the clothing; build their own houses; make their own tools; and in all other ways to be as completely independent of the outside world as they could be. The English manorial system was based upon the idea of self-sufficiency; but the more advanced portions of the world are following the plan of the geographical division of labor, which can be employed only when efficient transportation is available. The whole modern economic system demands transportation—rapid, specialized, highly organized, dependable and cheap.

Early Land Transportation in the United States.—In the colonial days and for a considerable period afterward, the people were too few and too much engaged in getting a living to give systematic attention to roads or any other improved means of transportation. Trails were marked out, or previous Indian trails adopted, and people traveled on foot, and often carried loads on their backs for long distances. Certain of the trails grew into bridle paths along which people could travel on horseback, and pack animals could carry loads. Such trails or paths were far more easily made than wagon roads, and even after the United States became a nation, a great deal of carrying was done by pack animals, as is still the practice in many Latin-American countries. For example, a history of Cumberland County, Penn., published in 1848, says:

> "Sixty or seventy years ago five hundred packhorses have been seen at one time in Carlisle (Penn.) . . . loaded with merchandise, also salt, iron, etc. The pack horses used to carry bars of iron on their backs, crooked over and around their bodies; barrels or kegs were hung on either side of these . . . In southwestern Pennsylvania much opposition was manifested to the widening of the horseways or bridle paths by the owners of pack horses, who foresaw that the creation of highways broad enough to be used by wagons would lead to the loss of their occupation."

Gradually the trails most used were made into roads for wagons. This was usually done by corporations that established toll gates at frequent intervals along the turnpikes, and all who walked or drove over them paid toll. The building and maintaining of roads at public expense came very gradually. Early bridges were practically all toll bridges which charged pedestrians, riders, or vehicles from 2 to 15 cents for crossing. Toll gates were at various distances apart, usually ranging from 2 to 10 miles, and the average charge was about ½ cent per mile for a man on horseback, and from 1 to 3 cents for conveyances. Tolls alone were higher than persent rail rates for the transportation of freight.

The most famous of the publicly built turnpikes (authorized by Congress in 1806) was the Cumberland Road or National Road which extended from Cumberland, Md., westward into Illinois. It never actually reached Jefferson City, Mo., its intended terminus. Over the turnpikes, which were often in wretched condition, stage coaches and heavy freight wagons carried passengers, mail, and freight. The great highroad from Philadelphia to Pittsburgh was the scene of a steady procession of canvas covered Conestoga wagons. The average cost of thus hauling a ton of freight between the two cities was $100. About the same rate prevailed between Albany and Buffalo, N. Y. An average charge for a long haul by wagon was 30 cents a ton-mile. To haul wheat by wagon from Buffalo to New York would have cost three times the price of the wheat in New York. Iron works in Pennsylvania only 30 miles from Philadelphia paid more for transporting their product to Philadelphia than the ocean rate from England, 3,000 miles away. The cost of land transportation was so great that only valuable commodities could stand the added cost, and commercial transactions were thus narrowly limited.

Early Transportation by Water.—Overland transportation was so difficult and so expensive that all possible use was made of the waterways. Even small rivers were used at times of high water; and on rafts, flat boats, arks, and other homemade craft the settlers moved some of their products to market. Many rivers that now seem entirely too small to be used for navigation were extensively used in the past. For example, it is recorded that in the spring and early summer of 1827, more than 3,000 rafts, arks, and keel boats, descended the Susquehanna River.

The rivers flowing into the Atlantic were of inestimable value to the early settlers, and most of the important settlements gradually worked their way up these rivers, by which the settlers retained some connection with the seaboard. The majority of these early settlements could not have succeeded had they not been able to float their products to market on the rivers. The cost of overland transportation would have been well-nigh prohibitive. The cost of transportation on the larger rivers and canals was only one-tenth or even one-twentieth of the cost by wagon.

The Importance of the Ohio River.—The one large river of the United States flowing for a long distance (967 miles) from east to west is the Ohio. For several decades the great westward movement of population used this waterway as one of its chief highways into the West, and by 1812 there was nearly a continuous chain of settlements along the river. After this section became populated, the Ohio was the main route by which the settlers sent their corn, wheat, pork, tobacco, whiskey, and other products to market. Pittsburgh, Cincinnati, Louisville, and other river towns shipped and received large quantities of products. The river was literally alive with craft, especially during the steamboat period. Upwards of 1,200 steamboats regularly plied the Ohio and Mississippi rivers, and the water front of any one of the chief river towns was so crowded with boats that traffic was seriously hindered. The steamboat—which first appeared on the Ohio in 1811 —greatly quickened the passage between the up-river ports and New Orleans; most notably of course, the up-stream trip which previously was extremely arduous. After the advent of the steamboat the passenger fare from New Orleans to Pittsburgh dropped from $150 or $160 to $35 or $40. Even the first steamboats charged 5 cents a pound for freight from New Orleans to Pittsburgh, five or six times as much as for down-stream freight. The cheapness of the latter was a boon to the settlers, whose products cheaply reached New Orleans and thence more distant markets.

When railroads became serious competitors of the waterways in the decade between 1840 and 1850, river navigation ceased to grow, and after the Civil War declined until regular steamboat traffic on the Ohio nearly reached the vanishing point. For a long time the movement of coal barges down the river was an important and cheap method of sending coal from the upper Ohio to down-river points, including New Orleans. However, that traffic on the lower Ohio and Mississippi has also nearly ceased and it now seems to be a question whether the improvement of the Ohio by means of movable dams and locks is likely to restore any large amount of traffic to the river.

Navigation of the Mississippi.—During the period of settlement and early development of the central United States, the Mississippi played a part whose significance can scarcely be overestimated. The richest farm lands of North America are in the interior of the continent. Between them and the Atlantic seaboard lies the Appalachian Mountain system. This mountain barrier has now been conquered by the railway builders; but it effectively prevented the early settlers in the interior from sending their products to eastern markets, until after the establishment of shipping lines through the Great Lakes and Erie Canal and lesser canals in the central states. Down to the Civil War period the Mississippi carried to the outer world a large but diminishing proportion of the products of the Middle West. Its waters teemed with craft of many types—flat boats, bateaus, keel boats, rafts, and finally the stern-wheel steamboat whose crowning glory was the "Floating Palace," as the finest passenger boats were termed. But the opening of the Great Lakes-Erie Canal route and, later the opening of railway lines to the East, sealed the doom of the Mississippi traffic. The Civil War merely hastened the decline.[1]

During the World War and afterward the United States government established and maintained a barge line on the Mississippi between St. Louis and New Orleans. It carries freight at 80 per cent of the railway rates and has built up a considerable traffic, but if all the costs in maintaining this traffic are figured, the amount is probably more than the railroads would charge for the service. It is unfortunate that so much misinformation is disseminated in connection with much of the agitation for waterway appropriations. There is a certain glamor about waterways that readily appeals to the imagination and makes agitation for them seem like an effort to secure great public benefits. But the experience which the people of the United States have had with their hundreds of millions of dollars of public money devoted to the improvement of rivers and creeks and the building of canals has been almost invariably disappointing and a part of the public at least is becoming increasingly skeptical of these costly enterprises.

The Period of Canal Transportation.—During the period when inland water transportation was the main dependence of the people of the United States many canals were constructed to connect or supplement natural waterways. New York and Pennsylvania especially led in these enterprises. Many short canals were built, but the major efforts gathered around three types of undertakings: (1) Efforts to connect the Great Lakes with the Atlantic; (2) efforts to connect the Ohio River with the Atlantic;

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[1] For decades waterway associations, civic associations, and other interested groups have besieged Congress for large appropriations of public funds to be spent on the Mississippi and its main branches. Hundreds of millions of public money have been appropriated; about 100 million dollars for the Ohio; more than 100 million dollars for the Mississippi; and another 100 million dollars for other streams. Yet these expenditures seem only to bring demands for still larger appropriations and in the meantime the traffic on the Mississippi and other rivers is very small and on some of the rivers has almost disappeared

and (3) efforts to connect the Great Lakes with the Ohio and the Mississippi. Both (1) and (2) involved the discovery of possible routes across the Appalachian highland, and the construction of canals along these routes. Of four attempted canals across this eastern highland only one succeeded in reaching its goal, namely the Erie Canal in New York. Pennsylvania, Maryland, and Virginia all built canals as far westward as the mountainous topography of their western portions would permit, but none of them established complete water connections between the Atlantic and the Ohio River.

Two main canals across Ohio connected the Ohio River and Lake Erie, and one in Indiana did the same (Fig. 122). Another in Illinois connected Lake Michigan with the Illinois River which flows into the Mississippi; and a very short and unimportant one in Wisconsin completed water connection between Lake Michigan and the Mississippi River. Most of these canals performed valuable service for a time, but after the establishment of railroads, the canals were used less and less and have either been actually abandoned or are but little used. Illinois is planning to deepen its waterway between Lake Michigan and the Illinois River to connect with the Chicago Sanitary and Ship Canal which extends from Chicago to Lockport, 33 miles. Most of the canals in the eastern states have also been abandoned, though not all. New York, how-

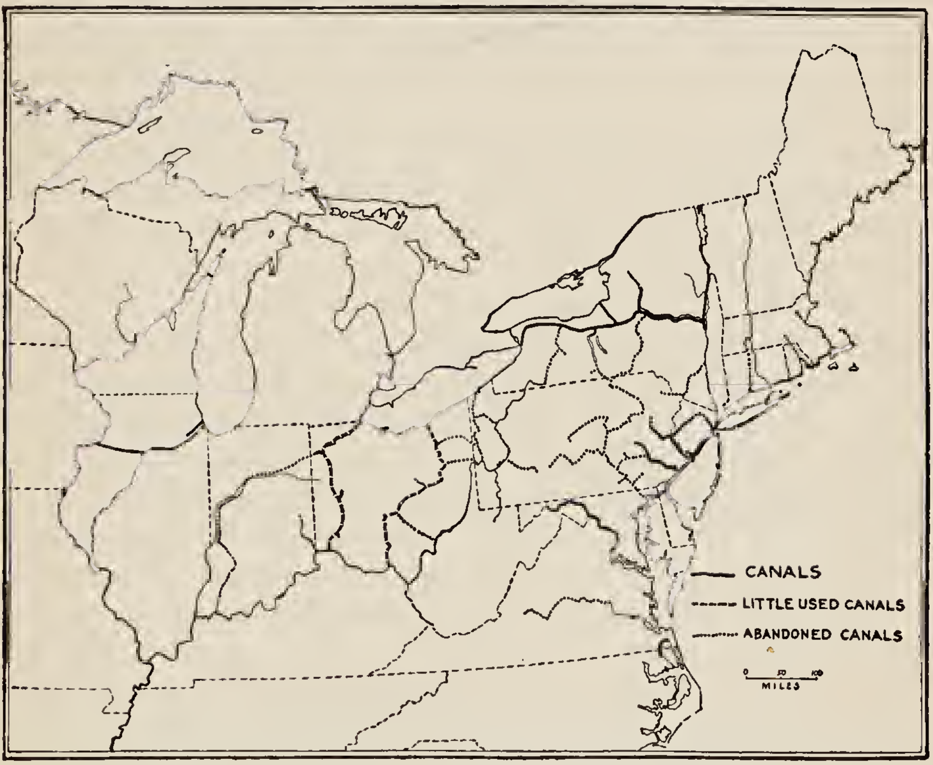

FIG. 122.—The canals served a useful purpose in pre-railroad days, but most of them have now been abandoned or are little used. (*Courtesy Macmillan Co.*)

ever, has spent a great sum of money in enlarging the Erie Canal, the Champlain and Hudson Canal, the Oswego Canal, and minor branches.

The Erie Canal.—So important to the nation was the old Erie Canal, and so successful was it, that it stands in a class wholly by itself. This famous canal was made possible by the peculiarly favorable topography of New York State, and was achieved by the faith and energy of Governor De Witt Clinton. The Hudson River, the Mohawk Valley, and the Lake Ontario Plain gave to New York the only practicable route by which a canal could be built between the Atlantic and the Great Lakes, and the building of that canal performed a service of inestimable value to New York and to all the states bordering on the Great Lakes. For decades it was the busiest inland waterway in the world, and paid its original cost several times over in the tolls that were collected. It was three times enlarged; the last time it was deepened to 12 feet and was partly relocated. Upon this enlargement—known as the New York Barge Canal System—the state expended upwards of 150 million dollars. The new canal was opened throughout its entire length in 1918, but up to 1928 it was carrying only about 15 per cent of its traffic capacity and less than the old canal carried before it was abandoned.

Reasons for the Decline of River Traffic.—The service performed by the rivers of the United States down to about 1860 was of utmost benefit to the country at a time when traffic was small as compared with the present, and when no better form of transportation was obtainable. But the enormous present volume of traffic, and the superior service given by the railroads, have entirely changed the situation. It is a fact that the railroads did all they could to make inland water navigation unprofitable, and this unfriendly attitude hastened the decline of the river and canal traffic. But the inability of the rivers to withstand the competition of the railways was due to fundamental and inherent defects of river navigation. In only one respect does river or canal transportation have an advantage over rail transportation and that is in point of cheapness; and even this advantage is often more apparent than real, for the rivers are put in condition for navigation and are maintained at public expense. If all of the costs of river or canal transportation are actually charged against the traffic the costs are found to be higher and in many cases, much higher than railroad rates.

The difficulties of river navigation are inherent in the nature of rivers. (1) Many of them are closed by ice for a part of the year; traffic then ceases and shippers must use the railways. (2) The depth of rivers fluctuates greatly and during the driest part of the year the water often is too shallow for navigation. The Ohio, for example, at times varies 40 or 50 feet in depth from low to high water, and the Missouri, rising in the semi-arid West, fluctuates so widely as practically to destroy its usefulness. (3) Rivers are crooked; the distance between points is

Note

longer than the rail distance. (In the case of the Mississippi, the distance between St. Louis and New Orleans is 65 or 70 per cent longer by river than by rail.) (4) Rivers erode their banks and are constantly depositing shifting sandbars in their channels. (5) The depths of water in the upper and lower parts of a river usually differ so much that a boat that is large enough to be profitable on the deeper part of the river cannot be used on the shallower portion or on the tributaries, thus preventing through shipment. (6) Since relatively few places are located on navigable waters, much of the river traffic must be brought to the river by rail and then from it by rail; the rail haul or hauls, plus the water haul, plus the cost of transshipping is likely to be more costly than an all-rail haul. (7) Partly because of the varying depths of rivers, river terminals are usually poor, warehousing facilities are inadequate, and river transportation is often badly organized, undependable, and slow. On the contrary, railroad transportation is well organized; a car can be loaded in Maine and go through to California, or Texas; it can be delivered on a side track in any one of the thousands of railroad stations not only in the United States but in Mexico, Canada, or Cuba; and furthermore, the railroad can build a spur to the very doors of the manufacturing plant or to the mouth of the mine. The same train can be made up of coal cars, cattle cars, tank cars, refrigerator cars, automobile cars, lumber cars, and general freight cars. Train service is usually more prompt, dependable, speedy, and the cost is but little if any higher. Such being the contrasts between railroad transportation and river or canal transportation, there can be no surprise that the latter have ceased to be significant factors in American transportation.

If, for some special reasons, a river or canal is so located that it can carry exceptionally large quantities of heavy, cheap freight, such as coal, brick, cement, or crushed stone, then water transportation is decidedly economical, and the cost of maintaining the waterway is in all probability fully justified. If the Ohio and Mississippi carried great quantities of such commodities, the public expenditures on these rivers would be justified. The trouble is that while the business of the country has doubled and trebled and the public expenditures on the rivers have increased still more, river traffic has declined.

Transportation on the Great Lakes.—From the days of the opening of the Erie Canal (1825) down to the present, the Great Lakes have contributed greatly to the development and prosperity of the country. They carry the heaviest traffic of any inland waterway in the world; the weight of products carried through the Detroit River is almost double that carried through the Panama and Suez canals combined (Fig. 123). The cheapness of the service arises from three geographic conditions: (1) Their greatest extension is from east to west, the direction of the largest movement of freight; (2) they are so large and deep that relatively little expense

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is required for maintaining navigation, and boats of great capacity can navigate them; (3) they connect the iron ore and grain regions of the Middle West and Northwest with the populous, industrial, coal-producing regions farther east.

In the period when settlers were seeking land and homes in the West, the lakes with their relatively easy, cheap transportation were of incalculable benefit; and they were of scarcely less benefit in providing cheap transportation eastward for the farm and forest products of the states on their western borders. For example, in 1840 there were 8 regular lines of passenger steamers running between Buffalo, Milwaukee, and Chicago. In 1860, no less than 300 steamboats were regularly carrying passengers and freight on the Lakes. Sailing vessels reached their maximum about 1870, when there were 1,800. Later a good deal of general freight was carried by boats belonging to the railroad companies, but in 1914 a law of Congress compelled these companies to dispose of their steamships, and after that the general freight traffic on the Lakes fell to relatively small proportions.

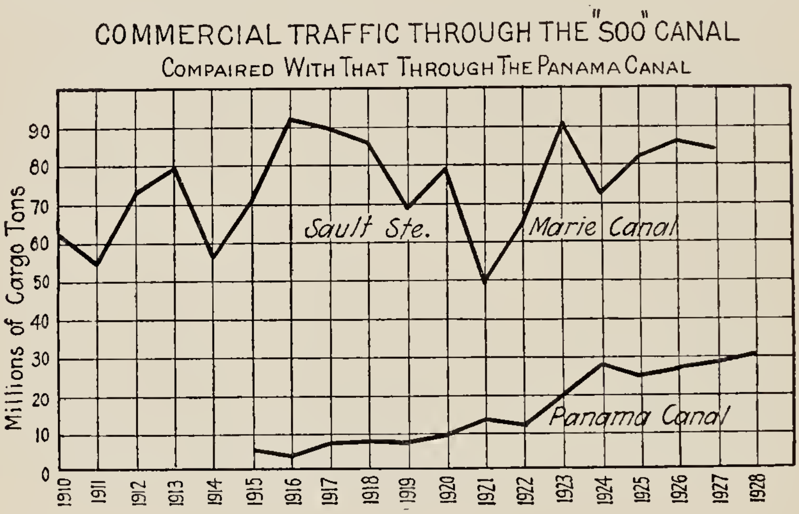


Fig. 123.

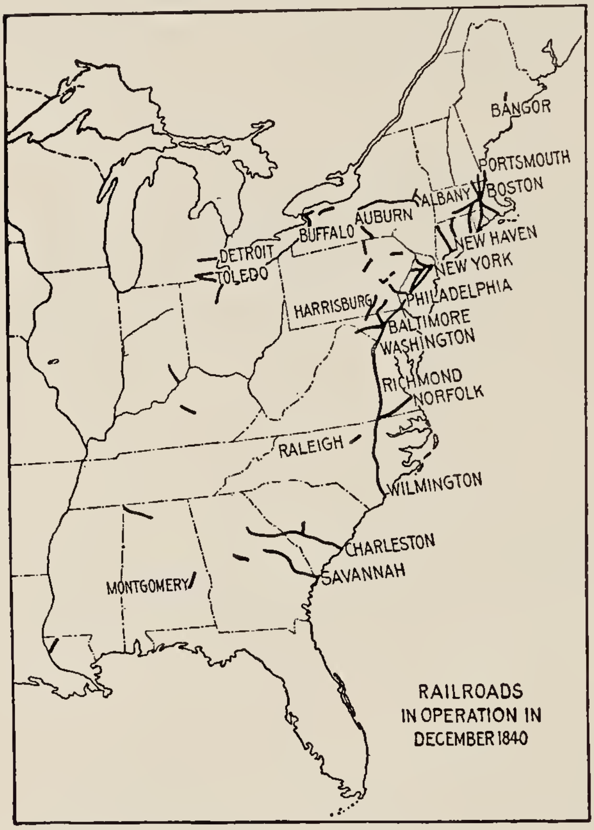
However, another type of traffic has grown to enormous proportions; it is the carrying of bulk cargoes of iron ore, coal, and grain. Specially designed and very efficient boats now carry from 10,000 to 14,000 tons of iron ore or coal or a quarter of a million bushels of wheat at very low freight rates. At the present time, coal and iron ore are carried 1,000 miles for about 50 cents a ton, or one-twentieth of a cent per ton-mile, the lowest rate ever attained except by ocean carriers. These extremely low costs are brought about by a combination of favorable factors. The traffic in the three commodities (coal, iron ore, and grain) is so great that specially designed boats, specially designed loading facilities, and exceedingly rapid unloading facilities have been constructed at the upper lake ports and lower lake ports. A 10,000-ton cargo of iron ore can be delivered into the hold of a boat in less than an hour. Coal cars with 50 tons of coal are tipped up bodily and their contents dumped into a vessel in one minute; and grain is loaded and unloaded very rapidly and cheaply by elevators. Thus by (1) carrying large cargoes, (2) long distances (1,000 miles or more), and by (3) losing very little time in loading and unloading, these bulk freighters have reduced carrying costs, to an exceedingly low level. However, in the carrying of miscellaneous freight in odd lots, these economies can not be effected, and the superior, year-round service given by the railroads takes the greater part of this traffic.

Canadian Waterways

The Great Lakes-St. Lawrence Waterway.—Canada and the United States have equal rights in all the Great Lakes except Lake Michigan, which is wholly within the United States. At Sault Ste. Marie (the "Soo"), Canada has constructed a canal around the rapids and the United States has constructed two. The Niagara River cannot be used for navigation between Lake Erie and Lake Ontario on account of Niagara Falls, and Canada built the Welland Canal to connect these lakes; this has been deepened to 25 feet, and the number of locks has been reduced. The Welland Canal and Lake Ontario are used much more for the lake commerce of Canada than for that of the United States.

The upper St. Lawrence is not naturally well suited to navigation because of the frequent rapids; but 6 short canals, 14 feet in depth, have been constructed around the 6 stretches of rapids, and boats drawing not more than about 13 feet of water navigate the river and the canals down to Montreal, Canada's principal seaport, which is reached by large ocean vessels during 7 months or a little more each year. The St. Lawrence River and its valley are of utmost importance to Canada, for they provide the interior with an outlet to the Atlantic. The importance of this gateway to the Atlantic by way of Montreal and the St. Lawrence may be judged from the fact that more of Canada's overseas commerce passes through Montreal than through all other Canadian ports combined. The whole commercial life of the most populous part of the Dominion depends largely upon this outlet, and so the St. Lawrence means far more to Canada than it does to the United States. It has been proposed that the two countries unite in establishing a 25- or 30-foot waterway from the Great Lakes to Montreal. The cost would be vey large, although it is maintained by some that the water power that can be developed will pay the cost. Opinion regarding the wisdom of attempting this deep waterway is divided and further investigation is necessary.

Other Canadian Waterways.—The Ottawa River, the principal tributary to the St. Lawrence, has been made navigable for river steamers as far up as Ottawa the capital of the Dominion, and the Rideau Canal system connects Lake Ontario with the Ottawa River. Neither of these waterways is large enough or deep enough to be very serviceable under present conditions. Another minor canal and canalized river gives water connection between the St. Lawrence River and Lake Champlain in the United States, and this lake, it will be recalled, is connected with the Hudson River in New York, thus completing a navigable route from the St. Lawrence to New York Bay. However, very little traffic between Canada and the United States uses this waterway. The Trent River and connecting lakes in southern Ontario are partially navigable by reason of improvements that have been made, but this shallow waterway, too, is unimportant. There is at times considerable agitation in Canada for the construction of a deep waterway connecting Georgian Bay, on the east side of Lake Huron, with the Ottawa River and thence with the St. Lawrence. Such a canal would greatly shorten the water route between the upper Great Lakes and Montreal, but its cost would be very great, and the large number of locks necessary with the long


BANGOR
PORTSMOUTH
BOSTON
ALBANY
AUBURN
BUFFALO
DETROIT
TOLEDO
NEW HAVEN
NEW YORK
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PHILADELPHIA
BALTIMORE
WASHINGTON
RICHMOND
NORFOLK
RALEIGH
WILMINGTON
CHARLESTON
SAVANNAH
MONTGOMERY
RAILROADS
IN OPERATION IN
DECEMBER 1840

Fig. 124.—It is notable that in the early days of railroad building the Southern States built several of the longest lines.

period (5 months or more) each year during which the canal would be closed by ice, make the project of doubtful practicability. Throughout much of Canada, the rivers have been actively used for light navigation for 300 years. In large parts of this vast country the hunting and trapping of fur-bearing animals has long been the chief industry, and the rivers and lakes have been and still are the main avenues of travel. But so far as Canada is concerned, all other waterways sink into insignificance in comparison with the Great Lakes and the St. Lawrence.

Railway Transportation

The Early Railways.—The earliest railways had wooden rails, the cars were drawn by horses, and the tracks were in some cases regarded as public highways open to the use of any one who cared to use them. These conditions did not long continue; iron rails replaced wooden ones; locomotives—very small and crude—replaced horses; and corporation ownership replaced public ownership. (So firmly did the public believe in the importance of water transportation that most of the early railroads were built to connect or to supplement waterways.) For many years there was vigorous hostility to railroads because of their monopolistic character, and that hostility has never wholly disappeared. By 1840 railroads had become numerous, but most of them were short (Fig. 124). For example, there were some ten different railroad companies controlling short links in the territory between Albany and Buffalo, N. Y.; these were afterward united into the New York Central Railroad. Between 1850 and 1860 a most remarkable increase in railroad mileage took place, and since 1860 inland water transportation except on the Great Lakes has been more and more replaced by rail transportation (Fig. 125).

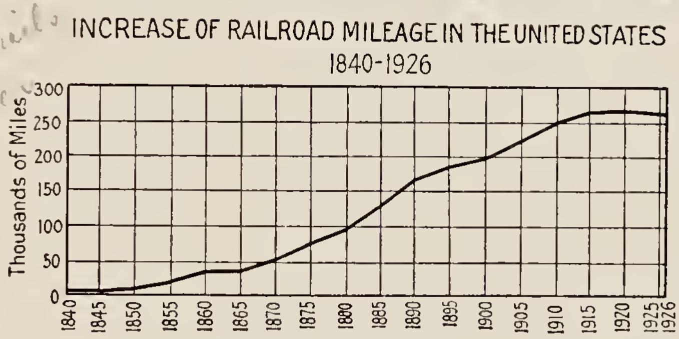

Fig. 125.

on rails – wooden rails
ocomotive – horses
lic ownership – private

The Commercial Gateways of North America.—Because of the excellence of the harbors themselves and because of natural trade routes leading inland from them, four ports on the Atlantic, one on the Gulf of Mexico, and two on the Pacific Coast of the United States, and one on each coast of Canada have become the water gates of the continent and the termini of the great trunk railroads. These are Boston, New York, Philadelphia, Baltimore, New Orleans, San Francisco, Seattle, Vancouver and Montreal.

It has already been pointed out that the one and only eastern corridor into Canada is the St. Lawrence Valley which is commercially dominated by Montreal.

The New York Central Railroad, paralleled by its subsidiary, the West Shore Railroad, takes the easy route followed by the Erie Canal and crosses the Appalachian highland at the low level of about 400 feet at Little Falls in the Mohawk Valley. The commercial dominance of the port of New York has led every important east-west railroad between the St. Lawrence and the Potomac to secure access to that harbor. Philadelphia is the natural eastern port of the great trade routes which focus upon the Pittsburgh gateway from the West. This gateway in the Allegheny Plateau, at the head of the Ohio Valley, now controlled by the Pennsylvania Railroad system, is scarcely second in importance to the route controlled by its chief competitor, the New York Central.

Continuing southward, the next important natural route from east to west is the Potomac Valley, occupied by the Baltimore and Ohio Railroad, the pioneer trunk line of the country (Fig. 126). Its eastern terminus is the port of Baltimore, although it has connections with other eastern ports. Still farther south is the James River Valley, the route of another east-west railway of importance—the Chesapeake and Ohio. It is interesting to note that each of these four great trunk railroads from the Atlantic seaboard to the West follows substantially the same route as that originally followed by the canals that sought to unite the Atlantic ports with the Great Lakes or the Ohio River. The great highways of the continent are laid out by nature, graded by the rivers, and carried over the mountains by the river-carved passes. Those railroads which early secured control of the natural traffic routes have become the dominating systems of the East. South of Virginia, the Appalachians are so rugged and so broad that no important railway route across them is practicable until the coastal plain of the Gulf states is reached.✓

The Mississippi Valley Railways.—So level and so productive is the Mississippi Valley that railways were easily and profitably built almost everywhere, but all of them focus upon the hub of the central railroad system, Chicago. From this center—determined by the southward protrusion of Lake Michigan—the main commercial arteries of the nation radiate in all directions. To the northwest and west extend the many lines of the Chicago and Northwestern; the Chicago, Milwaukee, and St. Paul; the Burlington, and others. To the west and southwest extend the Santa Fé and the Rock Island, and the Chicago and Alton. To the south extends the main north-south railroad system of the valley—the Illinois Central—terminating at New Orleans, the natural gateway to the Gulf.

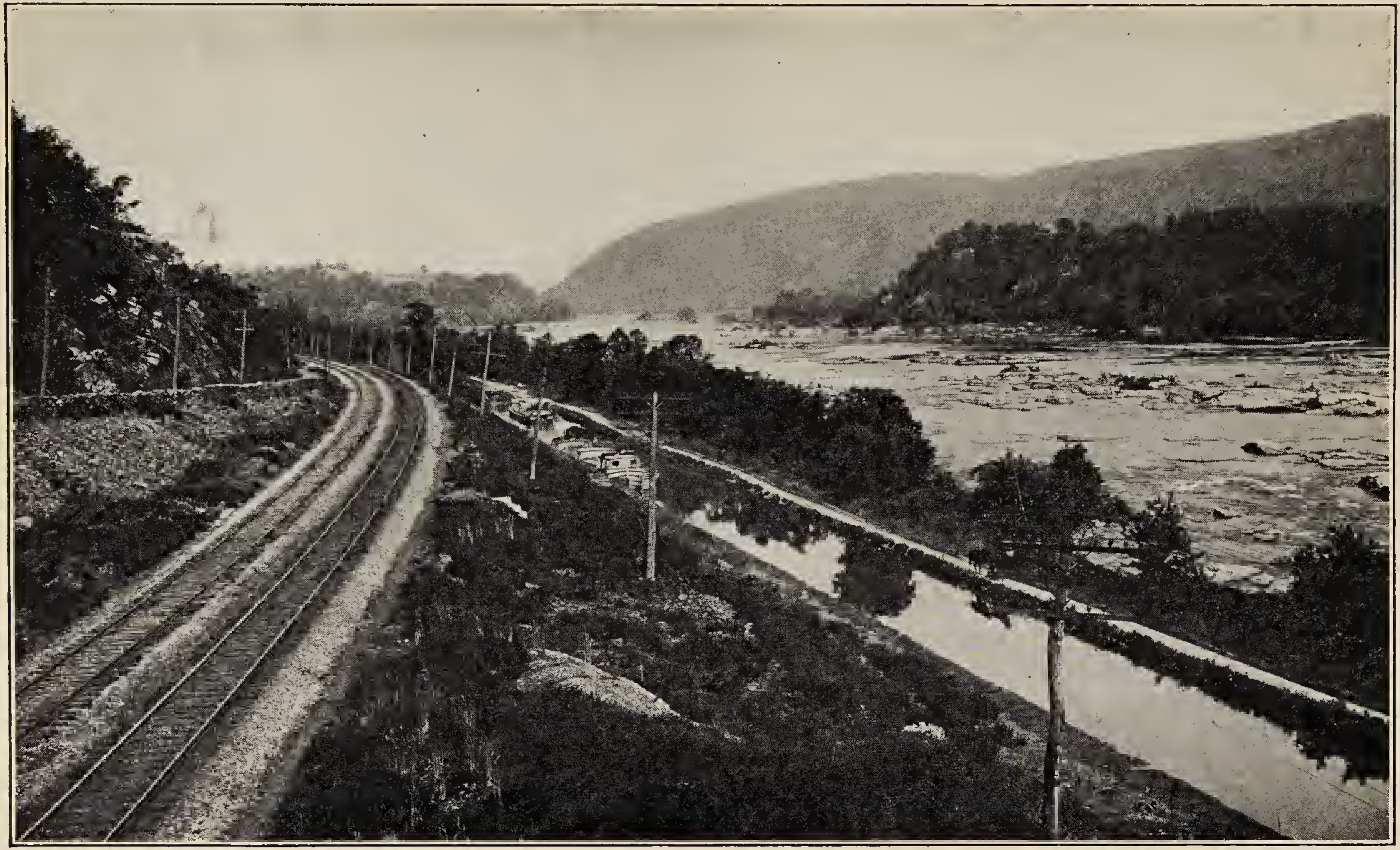

FIG. 126.—A valley thoroughfare. The upper Potomac is not navigable but in its narrow valley are the Chesapeake and Ohio canal and tow-path, the Baltimore and Ohio Railroad and (extreme left) the "Old National" highway. (*Courtesy of Baltimore and Ohio R. R. Co.*)

To the east extend the great trunk lines already named; and many lesser lines interlock with the major routes and supplement them throughout the Central Plains region.

The Pacific Lines.—The Cordilleran highland, flanked on the east by the Rocky Mountains, is broadest and highest in the middle, yet the first railway to the Pacific Coast took the central route because it was central. The Union Pacific and its western continuation, the Central Pacific (now part of the Southern Pacific), were completed from the Missouri River at Omaha to San Francisco Bay in 1869. The route was determined by the valley of the Platte, Sherman Pass through the Laramie Mountains, the Salt Lake basin, and the Yuba Pass through the Sierra Nevada range. The more recently built Western Pacific carries another railway system from the Mississippi Valley to the Pacific at San Francisco Bay.

The northern routes are easier because the mountain belt is lower and narrower, and three important lines connect the Mississippi Valley with Puget Sound; (1) the Northern Pacific, (2) the Great Northern, and (3) the Chicago, Milwaukee and St. Paul. The first two and the excellent Burlington system form essentially one group of roads, usually referred to as the "Hill lines," so named from the most commanding railroad man of his time, James J. Hill, builder of the Great Northern. The Santa Fé system—now one of the best—extends from Chicago to the southwest through New Mexico, Arizona, and southern California to Los Angeles and to San Francisco Bay. The Southern Pacific connects New Orleans with Los Angeles and San Francisco and sends important lines northward to Portland and Seattle and southward into Mexico.

Regional Groupings of American Railways.—Three regional groups of railways in the United States are recognized (Fig. 127):

	Approximate Miles of Road	Approximate per cent U. S. Lines	Approximate per cent U. S. Traffic Handled
1. The eastern group	59,000	24	45.5
2. The southern group	50,000	20	18
3. The western group	140,000	56	36.5

The figures are those of 1927, but they fairly represent typical conditions. It will be noted that nearly half the total traffic of the country is carried by the northern group of railroads, that is, those north of the Ohio and Potomac rivers and east of Chicago. This is a region of (1) great coal production, (2) extensive iron, steel and cement manufacturing, as well as general manufacturing, (3) large movement of agricultural products to eastern cities and ports, (4) dense population and heavy passenger traffic.

The South is less fully developed than the North and is less well supplied with railroads. Though larger in area, its railroads carry less than one-third the traffic carried by the roads of the northern group.

About two-thirds of the total area of the United States is served by the western roads which constitute over half of the mileage of the country and handle 40 per cent of the traffic.

Reasons for the Great Railway Traffic of the United States.—The United States has about 6 per cent of the world's population, and 6 per cent of its land area; but it has 43 per cent of its total railway trackage, and carries about 57 per cent of all the freight carried by the railroads of the world. The reasons for this enormous traffic are many, but a few of them should be noted: (1) The great production of coal, which forms about one-third of the weight of American railway freight; (2) the large production and consumption of lumber and the long distances over which much of it is hauled; (3) the quantity of agricultural products raised; (4) the magnitude of American manufactures, equal in value to those of any two other countries. These are merely evidences of the tremendous scale upon which industries of all sorts are conducted in this country of great natural wealth, occupied by an energetic people, who have become accustomed to large earnings and large incomes, and whose purchasing power is high.

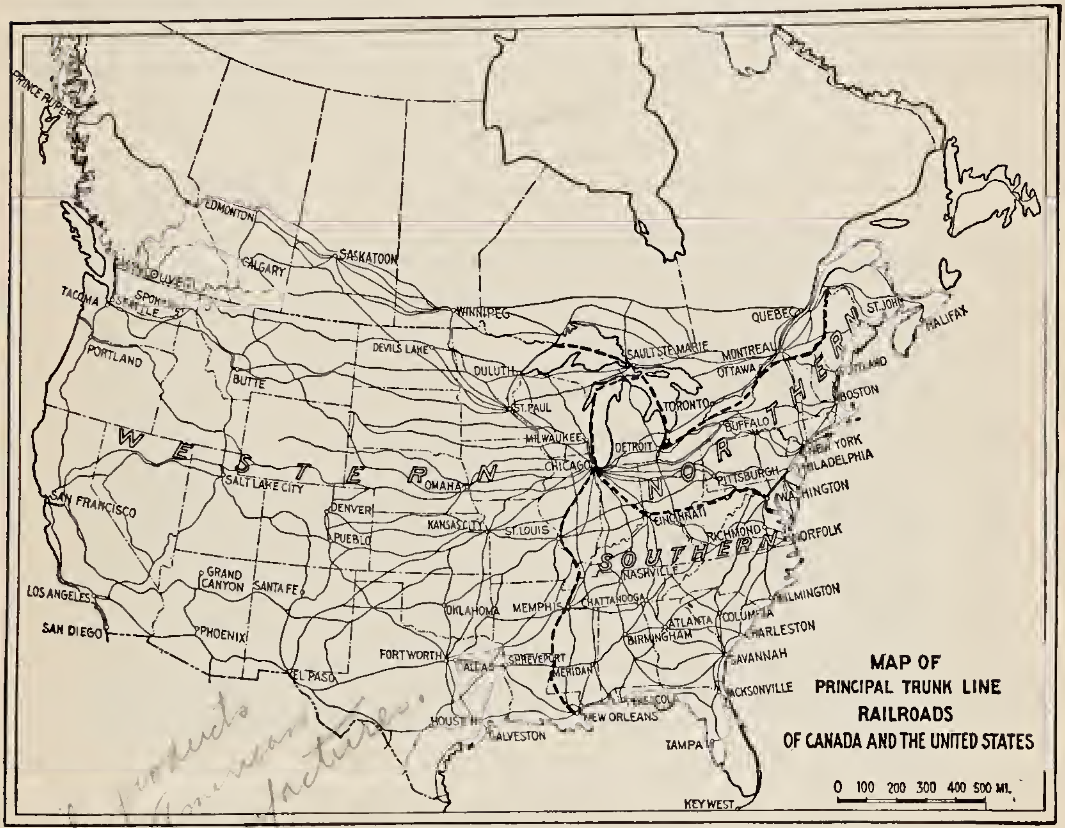
MAP OF
PRINCIPAL TRUNK LINE
RAILROADS
OF CANADA AND THE UNITED STATES
0 100 200 300 400 500 MI.
WESTERN
NORTHERN
SOUTHERN
PRINCE RUPERT
EDMONTON
SASKATOON
CALGARY
VANCOUVER
SPOKANE
TACOMA
SEATTLE
PORTLAND
BUTTE
WINNIPEG
DEVILS LAKE
DULUTH
ST. PAUL
MILWAUKEE
CHICAGO
DETROIT
SAULT STE MARIE
QUEBEC
MONTREAL
OTTAWA
TORONTO
BUFFALO
ST. JOHN
HALIFAX
PORTLAND
BOSTON
NEW YORK
PHILADELPHIA
PITTSBURGH
WASHINGTON
CINCINNATI
RICHMOND
NORFOLK
SALT LAKE CITY
OMAHA
DENVER
PUEBLO
KANSAS CITY
ST. LOUIS
SAN FRANCISCO
GRAND CANYON
SANTA FE
LOS ANGELES
SAN DIEGO
PHOENIX
EL PASO
OKLAHOMA
MEMPHIS
NASHVILLE
CHATTANOOGA
ATLANTA
BIRMINGHAM
COLUMBIA
WILMINGTON
CHARLESTON
SAVANNAH
FORT WORTH
DALLAS
SHREVEPORT
MERIDIAN
HOUSTON
GALVESTON
NEW ORLEANS
PENSACOLA
JACKSONVILLE
TAMPA
KEY WEST

FIG. 127.

al
lumber
agricultural products
magnitude of American manufactures

The railroads of Canada are now practically all combined into two systems, about 40 per cent owned by the Canadian Pacific system, one of the best in the world, and over 50 per cent owned by the Canadian government and known as the Canadian National Railways. On the west the Canadian Pacific terminates at Vancouver, and on the east at Montreal and St. John, New Brunswick. It is a wealthy road, owning hotels, transatlantic and transpacific steamship lines, and many subsidiary railroads, including roads in the northern United States. The Canadian National Railways are composed of several systems that were formerly independent, including the Grand Trunk, the Grand Trunk Pacific, the Canadian Northern, and the Intercolonial. These lines are less successful and far less profitable than the Canadian Pacific. In fact, the government roads operated for years at a heavy loss. A railroad connecting the wheat belt of western Canada with Hudson Bay has now been completed, but it is a visionary scheme and can scarcely be expected to be a financial success.

The Merits and Defects of American Railroads.—The United States has more miles of railroad than all Europe, and about 40 per cent of the world's total trackage; 2½ million freight cars, and 65,300 locomotives are in use. The quantity of freight handled is utterly beyond comprehension (475 billion ton-miles a year). The earnings of one system—the Pennsylvania—reach nearly 700 million dollars a year. As a whole, the principal roads are managed with remarkable efficiency and the passenger service in the best trains is excellent. Yet the railroads of the United States are in a precarious financial situation and many of them are struggling to keep out of bankruptcy. Unquestionably a large part of their difficulties may be traced to their own acts in the past and the public resentment at those acts. Not all the railroad corporations are guilty of these misdeeds but many have been guilty of stock watering, stock manipulation, fraud, and political corruption, and the American people have become highly indignant, and, through state and national regulations, have brought the railroads under such rigid control and at times such throttling control that their officials find themselves managers in name only. Their credit is impaired, labor, and all other operating costs have risen greatly, the public is semi-hostile and many of the roads are unable adequately to keep up their equipment and roadbeds. Partly on this account, there has been at times serious shortage of cars and congestion of traffic. This failure of the railroads to meet the full demands of the country is one cause of the agitation for a larger use of waterways, and for the construction of new waterways. Since most of our waterways are closed by ice for several months of the year, the railways must carry the entire traffic of the country during that period; this requires them to have or to aim to have sufficient cars and locomotives to do this; and if they are equipped to handle the entire traffic during the winter they should be able to do it in the other parts of the year. It is evident that water transportation with all of its defects and especially that of discontinuance during several months of every year, cannot solve our transportation difficulties. (1) We must have governmental supervision of railways in certain particulars but it should be unified and constructive. (2) Rates must be just to both shipper and carrier; and (3) a way must be found to give the employees justice without ever-recurring strikes or threats of strikes. If these conditions can be secured, the credit of the railroads will be restored, they can get the needed capital for extensions and new equipment, and our transportation difficulties will be relieved though probably never wholly corrected. Owing to the excessive movement of farm products during the autumn, shortage of cars and freight congestion will occur at that season, or else railroads must have a large surplus of cars and locomotives for use at this season but which will be idle the rest of the year.

Good Roads and Transportation.—Owing largely to the remarkable growth of motor traffic—both passenger and freight—a keen public interest in good roads has developed (Figs. 128 and 129). In all of the more wealthy and populous states millions of dollars are expended yearly in the construction of roads, the better ones costing more per mile than many of our railroads originally cost.[1] By 1928, about 625,000 miles of surfaced roads were in use in the United States; this is 71 per cent greater mileage than the railroads of the country have, and it is rapidly increasing.

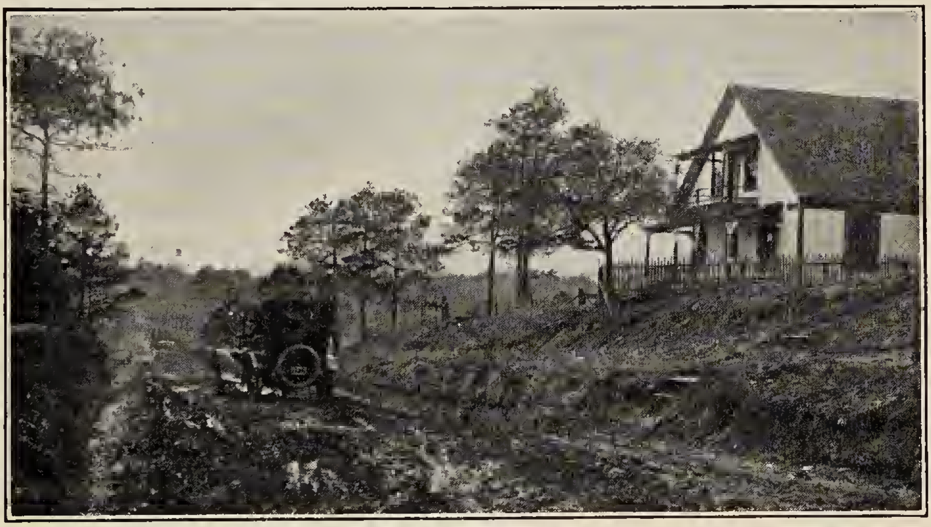

FIG. 128.—Great stretches of poor roads are inevitable in a new and sparsely populated country. (*Int. Harvester Co.*)

About 22 million automobiles and over 3 million trucks were in use in the United States in 1929. The amount of transportation performed by these vehicles is not accurately known, but it is very great and will probably increase. The freight-carrying autotruck and the motor bus have become important factors in public transportation and are taking from the railroads a large amount of freight and passenger traffic, yet it is quite possible that they directly and indirectly benefit railway traffic as much as they injure it. Whether or not the public roads supported by taxation ought to be open to the free use of these vehicles operated for profit is a question. They are exceptionally destructive to the roads, and it seems unjust to the railroads, which not only build and maintain their lines but are also taxed for all public purposes, including the building and maintaining of roads, that these roads should be freely used by their competitors, the motor buses and trucks. So greatly do good roads benefit the country at large and the farming interests in particular that their high cost is fully repaid. It is reported to cost the average farmer as much to haul his produce to the nearest shipping point as it costs to ship it by railroad 200 miles (Fig. 130). The cost per ton-mile for hauling produce on wagons on average country roads is 30 to 50 cents,

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[1] In 1928, Wisconsin expended 44 million dollars on roads, Illinois 76, New Jersey 33, Iowa 58, Pennsylvania 58, New York 99, and all of the states together are expending about 1½ billions of dollars a year.

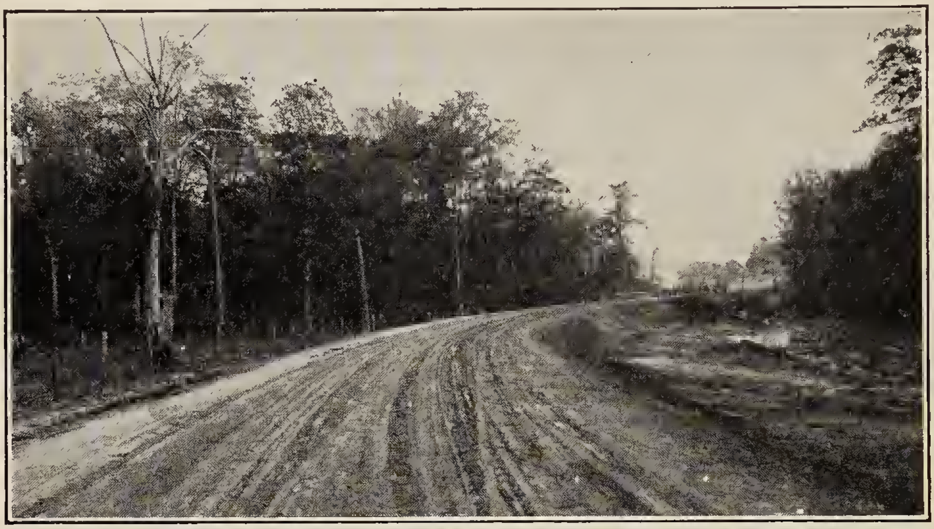

Fig. 129.—Good roads are being rapidly extended under the influence of motor transportation. Yet high cost prevents the improvement of many secondary roads over which farmers must market their produce. (*Int. Harvester Co.*)

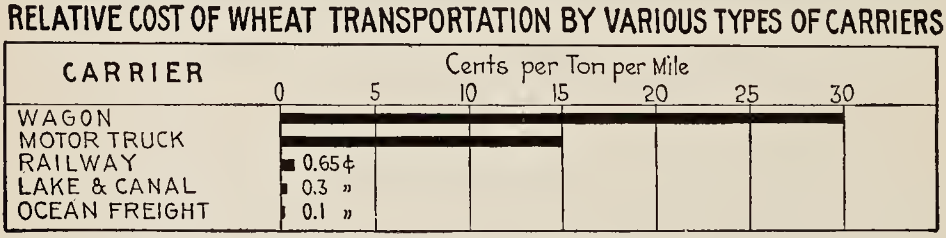

Fig. 130.—Costs of transportation per ton-mile by any of the above methods are variable. The figures given are approximate.

but on hard-surfaced roads it is only half as much and by motor truck it is still less. Unquestionably one of the most genuine public services that governments can perform is that of building and maintaining good roads.

Transportation of Petroleum by Pipe Lines.—Long ago the output of petroleum in the United States became so large that special means of transporting it were demanded. Much is still transported in tank cars and distributed by tank wagons, and hundreds of tank ships carry petroleum overseas; but pipe lines, tens of thousands of miles in total length, have become the great carriers of crude petroleum. The pipes are of various diameters up to 10 inches or more. Sometimes they are wholly underground; elsewhere they run for miles on top of the ground. At frequent intervals along the lines powerful pumps are installed to keep the oil moving. The pipes connect the oil fields with the refineries and with the coast. For example, the oil field of Kansas-Oklahoma is connected with the Gulf Coast, and with St. Louis, Chicago, New York Harbor, Philadelphia, and many intermediate places where refineries are located (Fig. 105).

The pipe lines are owned by the great oil companies or their subsidiaries, but they are "common carriers" and must transport the oil of independents when called upon to do so. Before the law, they are in the same situation as railroads. Of the 70,000 or more miles of pipe lines in the United States, the Standard Oil Company controls the greater part.

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CHAPTER XVI

FOREIGN TRADE AND TRANSPORTATION

GEOGRAPHIC INFLUENCES

General Facts about Foreign Trade.—Trade or commerce is an exchange of products between regions of surplus and regions of deficiency. Foreign commerce differs from domestic commerce principally in that it involves transportation across one or more international boundaries. In North America where two political units occupy most of the continent, a large part of the foreign trade must be conducted by water, but such is not the case in Europe, for example.

The factors which create a commercial surplus of certain goods here and a deficiency there are both geographic and economic in nature. These factors may be summarized under the following headings:

1. *Trade May Arise from Differences in Natural Endowment.*—(*a*) Differences in climate are fundamental to trade such, for example, as that in tropical fruits. Indeed, of all the natural forces which act persistently upon people and products and react upon international trade, climate is the most influential and the most all-pervading. (*b*) Differences in topography and soil may in some instances influence the flow of world trade. The world trade in tobacco is a conspicuous case of the influence of soil; yet it may fairly be questioned whether, even in this instance, climate does not exert the dominating natural influence. (*c*) Differences in natural resources are potent influences in world trade. Regions of abundant fuel and power may sell industrial wares and even fuel itself. Lumber is exported from regions of extensive virgin forest, and agricultural products from regions of abundant agricultural land.

2. *Trade May Arise from Differences in Race or in Economic and Political Conditions.*—(*a*) Differences in racial aptitudes appear, not infrequently, to influence the character of national products and trade. The French are notably skillful in the manufacture of artistic wares which are not at all characteristic of the manufactures of their English neighbors. Again, however, there is room for question whether the relative abundance of coal in the two countries may not have been of as great influence in fixing these characters as anything inherent in the dispositions of the peoples themselves. (*b*) Stage of economic advancement is a vital factor in the determination of differences in the foreign trade of regions. China has abundant coal and many other natural resources, but still remains primarily agricultural. Japan with

more meager natural endowment has stepped quickly into the rank of an industrial nation (*c*) Political control through its effectiveness or lack of effectiveness, through tariffs rebates, or other legislative devices is also a vital factor in the development of foreign trade. The close cooperation between the government and the commercial agencies of pre-war Germany is an example.

It is clear that while geographic factors—the features of earth environment—are of fundamental importance to the flow of foreign trade, they are intimately interlocked with many equally potent influences which are not geographic.

The Development of American Foreign Trade.—From the period of the earliest settlement the American colonists were dependent on overseas trade. The settlements on the Atlantic Coast were scattered, roads were lacking, and communication was almost altogether across the Atlantic with the "mother countries." The tobacco of Virginia, the pine trees of New England, and the furs of Canada were shipped to Europe in exchange for European wares. In New England particularly, the difficulties encountered in agriculture led many to seek a livelihood on the sea, where the close proximity of good fishing ground added inducements to a seafaring life. The abundance of oak and pine timber of the highest quality made shipbuilding an important industry, and ships themselves, made in New England and sold in Europe, became an important export commodity. In this period the same man was often shipbuilder, shipmaster, and merchant.

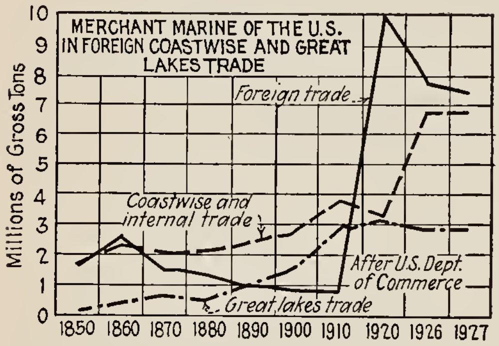

FIG. 131.—The gradual development of shipping in coastal and inland waters is quite in contrast with the sudden increase in ocean shipping which resulted from war activity.

Following the American Revolution, numerous laws were passed for the protection of United States shipping, and the merchant marine kept pace with a growing foreign trade. In the period between 1800 and 1830 an average of between 80 and 90 per cent of the foreign trade of the United States was carried in American ships. For many years thereafter, until the period of the Civil War, shipping continued to increase in amount, yet not so rapidly as the total value of foreign trade. In 1860 United States ships carried about two-thirds of the foreign trade of the nation.

The years from 1861 to the close of the century marked a substantial, if somewhat irregular, growth in the total value of foreign trade of the United States, but a progressive decline in the size of the American merchant marine (Fig. 131). About 1890 less than 10 per cent of the foreign trade of the country moved in its own ships. This decline may be attributed to a combination of political and economic causes, the latter fundamentally geographic, which discouraged the investment of American capital in shipping, but afforded it new and vast opportunities elsewhere. (1) The period was one of rapid expansion westward into rich agricultural lands. Coal, oil, iron, other minerals, and forests were attracting men, and interest waned in the modest returns of the shipping business. (2) The sailing ship was giving way to the larger and more dependable steamship, particularly to those constructed of iron and steel. In the building of steamships Great Britain, with her established iron and steel industries and her skilled and less expensive labor, had an advantage over the United States.

Of no less serious consequence were certain political and historical factors such as (1) the destruction of shipping during the Civil War, and (2) the removal by Congress of protection to the shipping industry enacted at earlier dates.

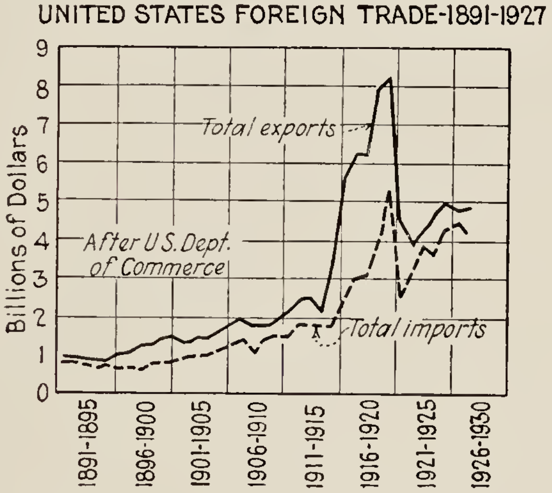

Fig. 132.—(*After U. S. Dept. Commerce.*)

It appears, therefore, that, at the opening of the present century, the United States had a large and growing foreign trade but a relatively small merchant marine.

America's New Position in World Trade.—With the opening of the new century came a change in the tide of American foreign trade. The development of manufacturing industries yielded a gradually increasing surplus of wares for export and increased the demand for imported raw materials. Industrial development also helped to reduce the handicap under which the American builder of steel ships had labored.

In the second decade of the century came the World War with its unprecedented demand for American goods and a sudden necessity for American ships. The close of the war found the United States the greatest trading nation in the world and second only to Britain in the tonnage of its merchant fleet. Figures 131 and 132 show the trend of this development.

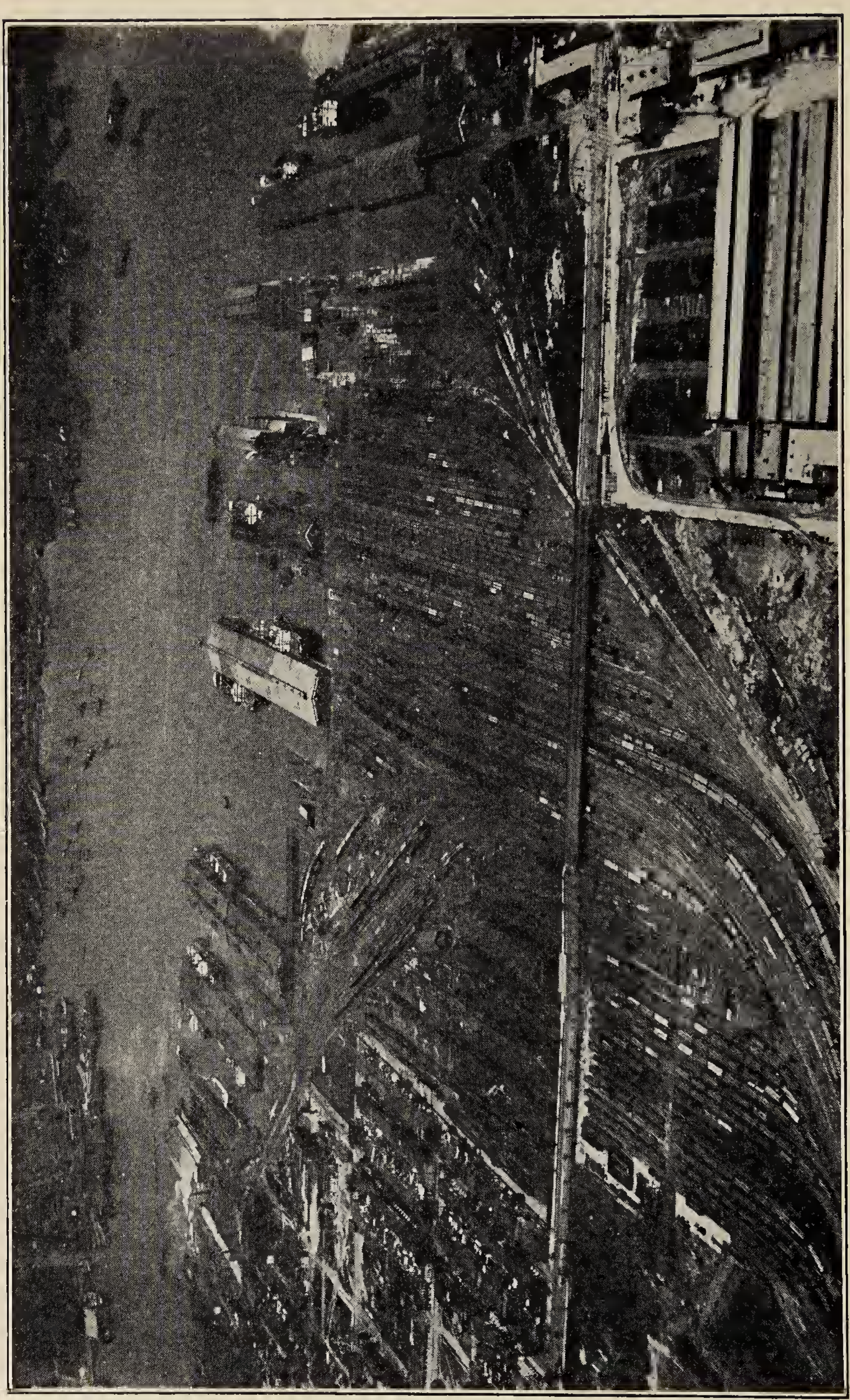

FIG. 133.—Locust Point Terminal, Baltimore. An excellent illustration of the land and water relationships of a port. (*Courtesy of Baltimore and Ohio Railway Co.*)

Gateways of American Trade

Factors in the Development of a Port.—The overseas commerce of any region flows in and out in response to fairly well defined geographic and economic conditions, and the gateways through which it flows are the ports of the region. Ports do not thrive merely because they are located upon the seacoast of a country. Those which grow and prosper do so because of geographic and economic advantages which are lacking at other points. The following are among the more important of such advantages: (1) A *good harbor* with opportunity for the construction of terminal facilities. The ideal harbor is provided with (*a*) a safe entrance of ample depth, (*b*) abundant anchorage room with protection from storms, (*c*) freedom from ice, (*d*) an approachable and extensive waterfront capable of improvement at low cost (Fig. 133). (2) A *large and productive hinterland.* (3) *Easy access to the hinterland.* Where physiographic features are such as to concentrate many lines of traffic upon one coastal point, as at New York, the effectiveness of this last factor is greatly increased.

COMPARATIVE VALUE OF THE TOTAL UNITED STATES FOREIGN TRADE OF 1927 WHICH PASSED THROUGH CERTAIN SELECTED PORTS OR PORT GROUPS

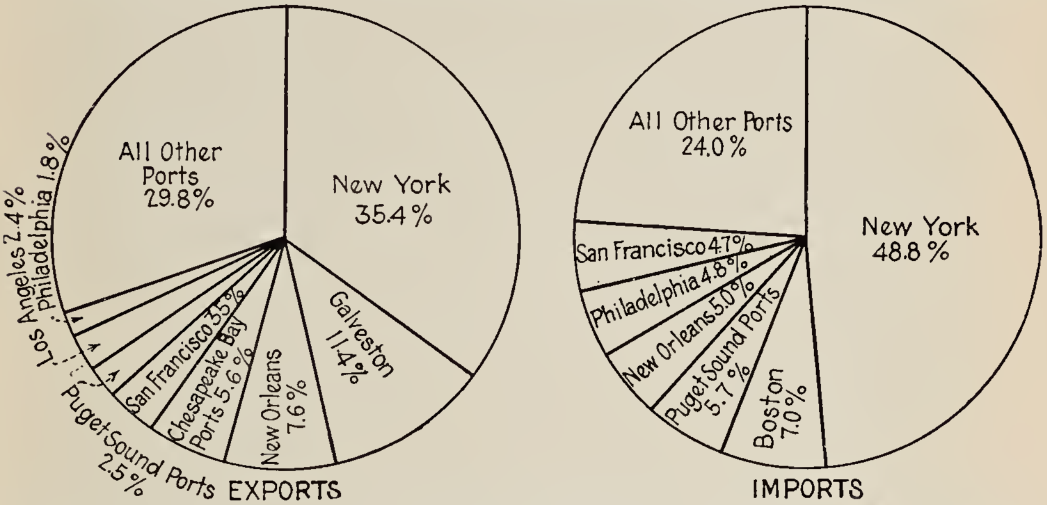

Fig. 134.—Nearly half of all the foreign trade of the United States passes through the port of New York.

The Port of New York.—New York is America's greatest commercial gateway (Fig. 134), through which passes nearly one-half of the total foreign trade of the United States. As a port, it is not without defects, nor has it been without rivals for commercial supremacy; yet it has maintained its position for more than a hundred years. Several advantages lead to this condition: (1) New York has easy access to a large and rich hinterland. The easy grades provided by the Hudson and Mohawk valleys are not found on the routes reaching westward from Boston, Philadelphia, or other eastern ports. This easy route to the interior first suggested the Erie Canal, which did more than any other one thing to establish the preeminence of New York. Later the same route was followed by the New York Central railway lines which have served the same end. The dominant position attained by New York under these

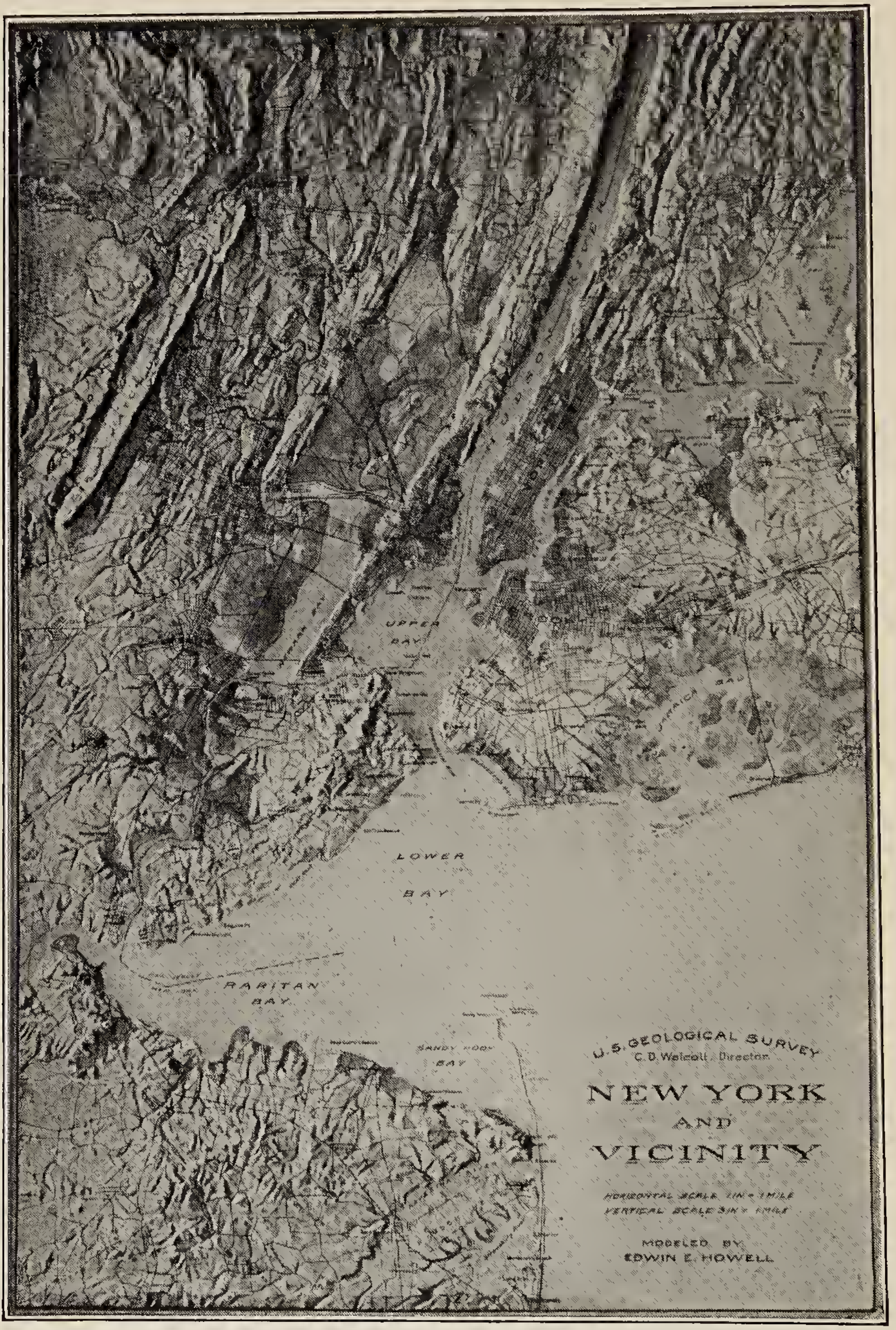
UPPER BAY
JAMAICA BAY
LOWER BAY
RARITAN BAY
SANDY HOOK BAY
U.S. GEOLOGICAL SURVEY
C. D. Walcott, Director
NEW YORK AND VICINITY
HORIZONTAL SCALE 1 IN = 1 MILE
VERTICAL SCALE 3 IN = 1 MILE
MODELED BY EDWIN E. HOWELL

Fig. 135.—The harbor of New York has commodious bays and an extended water front, but the port is so divided that freight transfer is often difficult.

early advantages practically forced the railways which later connected Philadelphia and Baltimore with the West to extend to New York also, thus contributing to its further growth. (2) New York has an excellent harbor (Fig. 135). The entrances to the harbor have required expensive improvement, but the expanse of protected water in its various bays and rivers is great. The water frontage of the entire port district, including all minor natural and artificial indentations, is 921 miles, an almost unbelievable figure. A total of 360 miles of this frontage is now developed for the berthing of ships and for the loading and unloading of cargo. (3) The principal trade of North America has, up to the present, been transatlantic, and more goods have been moved to eastern ports than to those of the South or the West.

Many non-geographic factors have helped to maintain New York's supremacy in spite of inconvenience in handling goods through the port and the competition of other eastern cities. Among these conditions the most important is the fact that, during the early period of commercial development there became established in the city great financial and commercial interests, and many other types of service which facilitate the movement of foreign trade. Although the other eastern ports have long been made accessible by railways and though rail rates have been equalized, yet the great volume of North American foreign trade continues to flow through the port of New York.

Other North Atlantic Ports.—A group of north Atlantic ports, of which the principal are Montreal, Boston, Philadelphia, and Baltimore, compete with New York for the trade of the northern interior.

Montreal is the most important port of Canada. Its export trade is much greater than its import trade, since it is a port of shipment for wheat as well as for wood products, dairy products, minerals, and manufactures from Ontario and Quebec. It has an admirable location 1,000 miles in from the edge of the continent and, due to its position with respect to the "great circle route" of the North Atlantic, it is 300 miles nearer to Liverpool than is New York. (Yet it has the great handicap of being closed to navigation by ice during 4 or 5 months of every year.) During these months Canadian exports are shipped by rail to the ports of the Canadian Maritime Provinces or of the United States.

Boston is the commercial gateway of the great industrial district of New England. The value of its imports, including the vegetable fibers, wool, hides, and other raw materials of industry, is greater than that of its export trade. The harbor of Boston is commodious and convenient (Fig. 136); it is well situated with respect to Atlantic routes, is well equipped, and it is served by railways which reach the whole of New England and even make a part of Canada tributary to it. Yet the total amount of trade handled through the port is small in comparison with the trade of New York. One explanation of this fact is to be found

ports >
xports.

in the physical isolation of Boston from the trade which in former years flowed through the Erie Canal. Boston's isolation gave to New York a commercial advantage which even the efficient railway connections of a later day between Boston and the West could not overcome. Economic factors of a complicated character also enter into the question.

Philadelphia, Baltimore, and Norfolk differ greatly from Boston in the character of their foreign trade, in that they are primarily export points rather than ports of entry. The export trade of Baltimore and Norfolk in particular, is many times greater in value than the import trade of those ports. The disparity in volume is even greater, since many of the export specialties are bulky commodities, such as grain, steel, and coal. The location of Philadelphia and Baltimore on southward-facing bays is something of a handicap to them in north Atlantic trade. The distance from Liverpool to Baltimore is 250 miles greater than to New York. In trade with South America, however, or in reaching the Panama Canal, this handicap does not exist. Philadelphia, which serves an industrial region, has much more import trade than Baltimore and Norfolk combined.

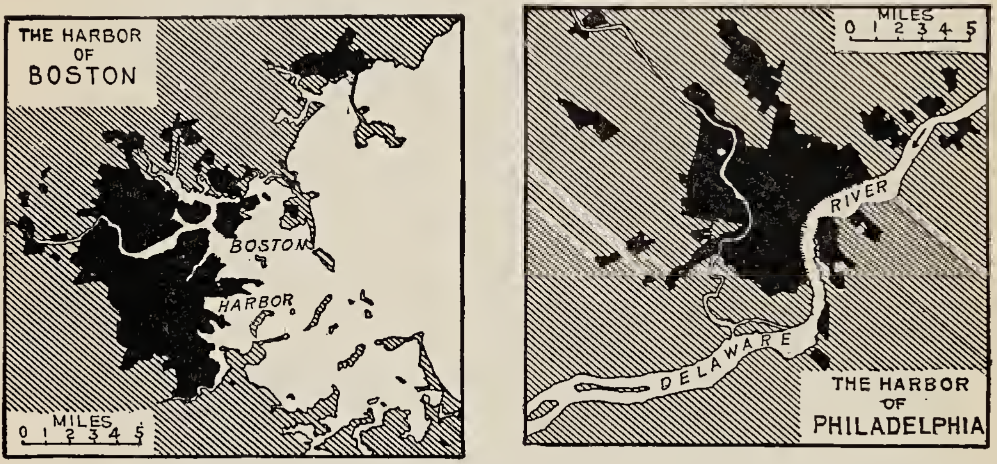

Fig. 136.—Boston harbor is a sheltered bay, while that of Philadelphia is a tidal river.

The Cotton Ports.—Galveston, New Orleans, and Savannah are the principal gateways of the cotton belt (see Fig. 52). They also are primarily export points. New Orleans, although it is the gateway for the importation of much of the Caribbean produce—sisal, bananas, sugar, coffee, and petroleum—has an export trade twice as great. The exports at Galveston outvalue its imports twenty times. In addition to cotton, a large quantity of grain and other agricultural produce from the northern interior is handled through these ports. In spite of the handicaps under which New Orleans competes with Atlantic ports (greater distance from Europe and nearly 100 miles of river approach), it is now the port of second importance, in tonnage of foreign trade, in the United States.

Pacific Ports.—Commercial gateways on the Pacific Coast of North America are few, and their total trade is considerably less than that of the Gulf ports combined. This is not for lack of harbors, although the coast line is generally much less approachable than that of the Atlantic side of the continent. Several Pacific ports have been provided with facilities where natural advantages were insufficient. San Francisco, Los Angeles, Seattle, Portland, and Vancouver have large harbors with good shipping facilities. They are termini of the principal transcontinental railway lines, on the one hand, and of transpacific steamship lines on the other. An explanation of the relatively small value of the trade flowing through these ports is to be found, rather, in other conditions, some of which are related to the geographic situation of the ports. (1) Their immediate hinterlands are small and sparsely populated. The coastal slopes and valleys constitute the principal parts of the area directly tributary to the ports, although in the north the Columbia Plateau is also to be included. (2) The ports are separated from the continental interior by long distances and difficult routes, and a large part of the intervening region is arid. (3) The coastal region has a limited industrial development. The principal export commodities are the products of natural resources—lumber, petroleum, and fish. Many of the most valuable agricultural staples are perishable and enter foreign commerce to a limited extent only. (4) The transpacific markets which are reached through these ports are small in size or have but a limited purchasing power. Both of the last named factors are likely to be modified by the growth of manufacturing, both on the Pacific Coast and in the Orient, and the change will tend to increase the trade of the Pacific ports. Many valuable commodities from the Orient and the tropics are entered at these ports and the values of the import and export business are more evenly balanced than in most of the Atlantic ports.

Note

Highways of American Foreign Trade

Factors in the Location of Ocean Trade Routes.—Connecting the ports of the world are ocean highways of fairly definite location and of widely differing importance. It may be considered somewhat strange that, when the broad oceans are free for all, ships should confine the direction of their movements to anything approaching definite routes. Yet there are a number of geographic conditions which influence them to do so. (1) The spherical shape of the earth makes the shortest distance between any two ports lie along a "great circle" passing through these ports. Other conditions permitting, ships will go by the shortest route. (2) The shapes of the continents sometimes force ships out of a direct route and cause them to converge upon some point or along some line of travel as, for example, in narrow straits or around projecting capes. (3) The general circulation of the atmosphere, vastly important in the day of the sailing ships, has not yet lost its influence upon the courses of ships. When it is otherwise practicable, shipmasters lay their courses to take advantage of favorable, and to avoid unfavorable, winds. (4) In the same manner even the ocean currents are taken into account. It is indeed a small ship whose operating expenses do not run into scores of dollars per hour, and even so small a factor as a favorable or an unfavorable current is considered. At certain seasons some of the ocean currents bear Arctic or Antarctic ice which becomes a menace to navigation and influences the courses of ships. (5) The location of stations able to supply steamship fuel is a cause for the bending of lines of traffic into routes which touch at those stations. (6) The ability of certain districts to supply cargo is an attraction which operates in a similar manner.

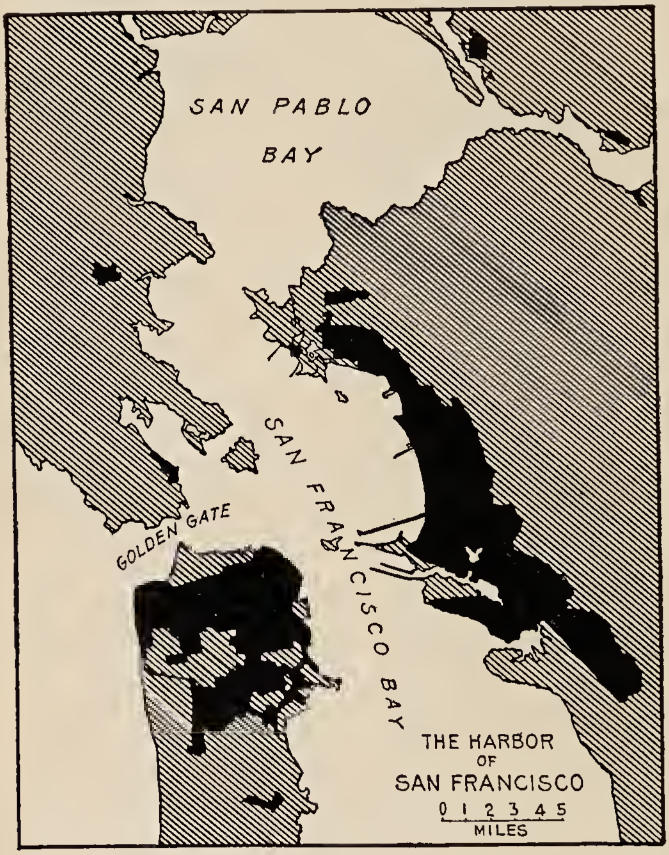

Fig. 137.—The ports on San Francisco Bay. City areas are shown in black.

The Features of an Ocean Trade Route.—The oceans are indeed traversed by numberless ship tracks, but only when many of them, for some combination of the above reasons, converge or coincide along a part of their way are the ships which traverse them said to follow a trade route. Such a route has two distinct features: (1) a central belt or trunk of varying length and width, with (2) a set of branches or feeders at each end, reaching into the many ports tributary to this route. The

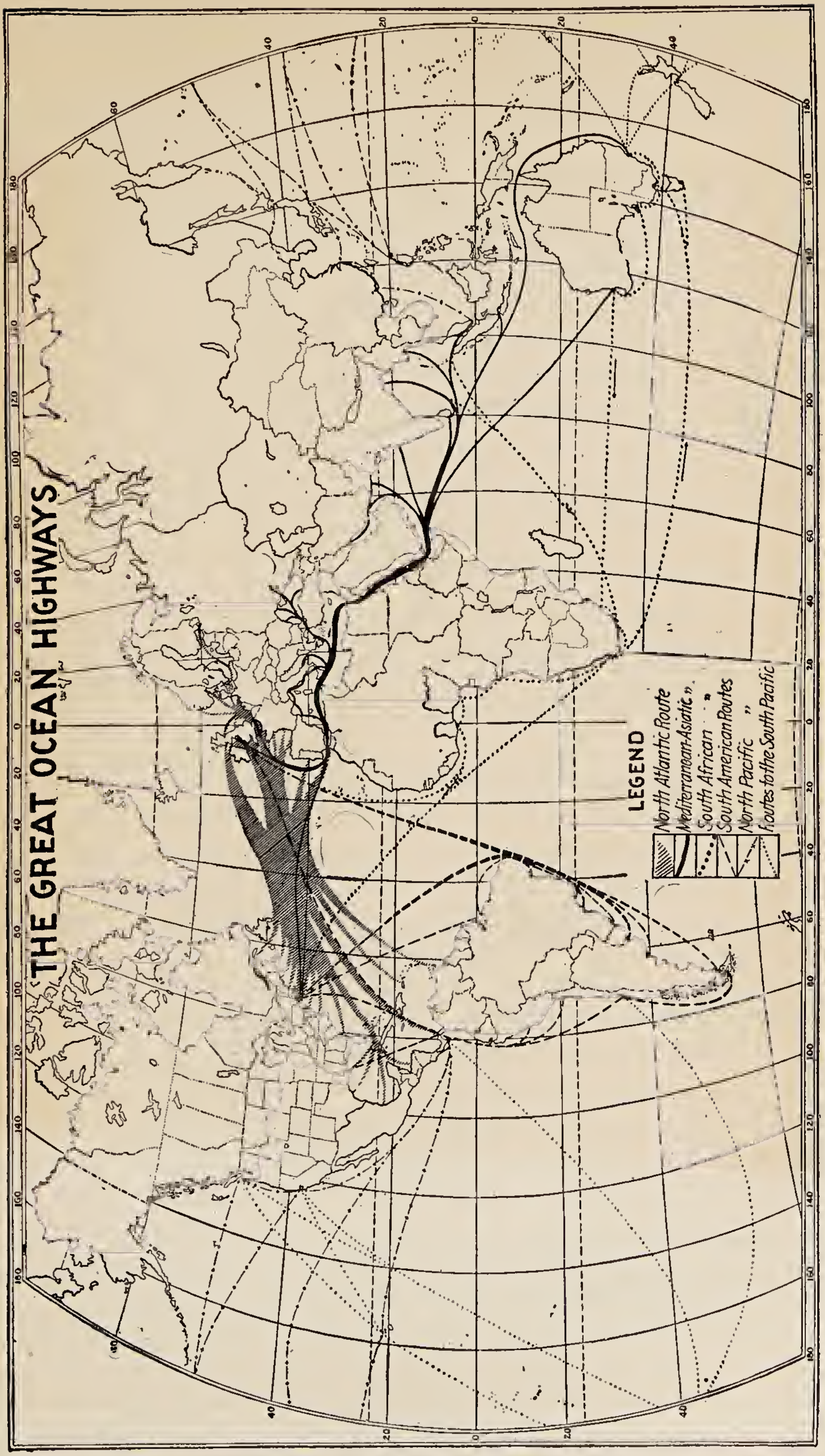
THE GREAT OCEAN HIGHWAYS
LEGEND
North Atlantic Route
Mediterranean-Asiatic "
South African "
South American Routes
North Pacific "
Routes to the South Pacific

Fig. 138.—The great ocean highways of the world are lanes of traffic with branches extending to many ports. The width of the lines and bands on this map are not intended to do more than suggest location and approximate relative importance.

principal ocean trade routes or highways of the world are shown in Figure 138.

The North Atlantic route is the most traveled of any in the world. Its feeders reach more than 100 ports, spread from Panama to Labrador, and an even greater number in Europe extending from Norway to Spain. The trunk of the route, a broad, curved band of ship tracks, represents in its location a compromise between the great-circle route and various modifications due to the influences of the other factors mentioned. It might seem that ships from the Panama Canal, bound for France, would sail directly across from the West Indies, and some do so. Yet, a course along the great-circle route brings them so far north that the advantage of cheap coal at Norfolk or of additional cargo at New York is sufficient to attract many and to cause them to complete their courses along the North Atlantic route. The volume of traffic flowing over this great ocean highway is said to require one-fifth of all the shipping of the world. Both ends of the route are abundantly supplied with steamship fuel.

The Mediterranean-Asiatic route connects the whole North Atlantic region with the Indian Ocean by way of the Suez Canal. Although many American ships use this route, it is of much greater importance to the European nations, especially to Great Britain. Much of the fuel required at intermediate stations on this route has to be carried from England or America.

The South African route connects the same regions as does the preceding. The trunk of the route lies between the Cape Verde Islands, where shipping from both sides of the North Atlantic converges, and Capetown, where it again diverges into the Indian Ocean. Although it is 2,500 miles farther from New York to Calcutta by this route than by way of the Suez Canal the presence of cheap coal in South Africa and the avoidance of the canal tolls attracts many ships to the route.

The South American Routes. *East Coast.*—Ships bound for the east coast of South America from both sides of the North Atlantic converge upon the eastward projection of Brazil. So far out into the Atlantic does this course take American ships that the distance from New York to Buenos Aires is only 400 miles less than the distance from Liverpool to that port. The southern feeders of this route extend from all of the ports of eastern South America and from Cape Horn. *West Coast.*—The trade between North Atlantic ports and those of the west coast of South America has been provided with a new route by the construction of the Panama Canal. This effects a saving of nearly 1,600 miles between Liverpool and Valparaiso, Chile, and of more than 3,700 miles between New York and the same port. Not even the delays and the tolls incident to passage through the canal are sufficient to offset this great saving.

On both of the South American routes, ship fuel is largely supplied by importation. Only on the west coast of South America are local supplies of coal and oil able to meet even a small part of the requirements.

Pacific Ocean Routes.—The size of the Pacific Ocean is so great, the ports upon its borders are so widely distributed, and the total volume of trade which moves across it is relatively so small, that avenues of steamship traffic are not so well developed upon it as upon the Atlantic. Nevertheless, geographic conditions influence ships plying between the ports on the two sides of the North Pacific in the choice of their courses. They may take (1) the shorter great-circle route which swings far north toward the Aleutian Islands, or (2) a longer and more southerly route touching at the Hawaiian Islands. The choice of the latter course adds 700 miles to the distance between San Francisco and Manila but has the advantage of passengers, mails, or cargo to be delivered or received at Honolulu or Guam. The most direct route even from the Panama Canal to Manila curves far to the north of the Hawaiian Islands, and often makes calls at San Francisco and some Japanese port advisable.

The Foreign Trade of the United States

11, B **The Trade of the United States with Mexico and the Caribbean Lands (Middle America).**—The United States is the principal buyer of the products of every important Middle American industry. For a decade more than 60 per cent of the total value of the exports from Mexico and the Caribbean lands has been sold in the United States. Much more than 60 per cent of certain commodities moves to the United States. This is notably true of sugar, bananas, tobacco, sisal, petroleum, and iron ore. Because of the geographical proximity of the United States and because the American people are the world's greatest consumers of some of these commodities there is reason to believe that this region

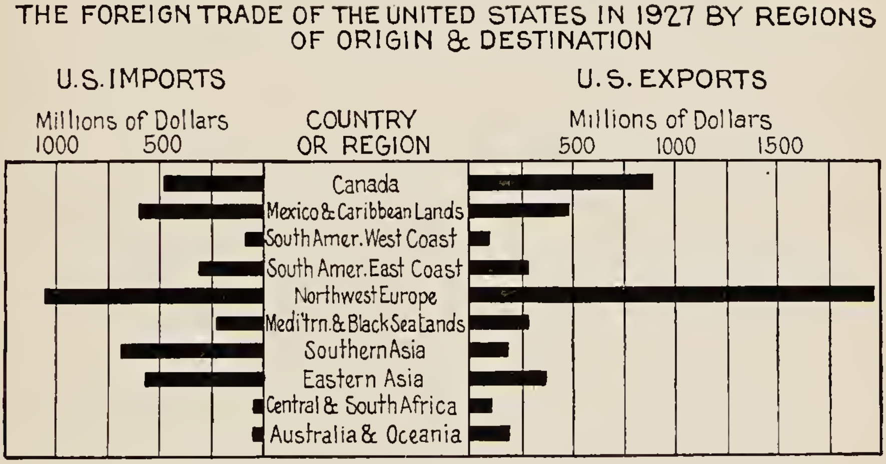

Fig. 139.

[illegible] & bulk of Mexican imports into the U. S. of U. S. exports into Mexico & Caribbean Lands.

will retain at least its present importance as a source of imports into the United States.

As a buyer of United States exports the region ranked third among the trade regions in 1927 (Fig. 139). (Its purchases amounted to nearly 9 per cent of the value of all American exports, exceeding the purchases of all other regions except those of Canada and northwest Europe.) Both the value and the bulk of the United States export trade to Mexico and the Caribbean lands is somewhat less than that of the commodities imported into the United States from the region. Some heavy substances, such as coal and lumber, are included in the list of exports but so also are many of higher specific value; grains, meats, and numerous manufactures of textiles, iron, and steel. As a result of this unbalanced volume of trade many outgoing ships sail, particularly from the Gulf ports of the United States to Mexico and the Central American ports, only partly loaded.

N.B.

N.B.

The trade of the United States with South America, both import and export, is less than that with the Middle American region. Exports to all parts of South America are similar and consist principally of manufactures of iron and steel, petroleum products, and many other types of manufactured goods, together with coal and lumber. Imports from the several sections of the South American region differ widely. From the east coast the principal items are the products of farms and forests; grains, coffee, meats, wool, hides, rubber, and many other things. The leading imports from the west coast countries are minerals—nitrate, petroleum, and the ores of copper, iron, and tin. The products of agriculture occupy a relatively unimportant place in the list. In general the exports of the United States to South America, in spite of the fact that manufactures constitute a large part of the total, are slightly less valuable and very much heavier and more bulky than the imports. Especially is this true of the trade with the east coast countries. As a consequence south-bound ships are usually well loaded while many north-bound ships seek full cargoes in vain.

N.B.

The Trade of the United States with Europe.—Europe, as a continent, is much the most important source of United States imports and the largest customer for her exports. In 1927 about two-fifths of the total United States exports went to the great industrial centers of northwest and central Europe alone. These exports consist principally of foods, fuels, and raw materials of animal, vegetable, or mineral origin and not of highly manufactured goods. An increasing proportion of the total, however, consists of the industrial wares that American manufacturers are able to produce in high quality and at low prices, such for example as automobiles, and typewriters. United States imports from Europe are numerous and varied. In general they are manufactures of high quality, although crude manufactures and even the unmanufactured products of European farms, forests, and mines are to be found among the exports of nearly all European countries to the United States.

Trade of the United States with Eastern Asia.—Trade across the Pacific Ocean is small compared with transatlantic trade. The great population of the Orient has a relatively low per capita purchasing power. Note Moreover, in parts of the Orient, the penetration of Occidental ideas and appliances has been so slow that there is a limited knowledge of or use for American manufactures. The latter difficulty is gradually disappearing and the large total population of the countries of eastern Asia indicates a market of great potential capacity. The total value of American trade with the Orient is similar to that with South America, and the values of imports and exports are fairly well balanced. The tonnage of the trade is, however, not at all well balanced. Among the more valuable American imports from the Orient are silk, tea, camphor, and other commodities of small bulk and high value. Among the important American exports to the Orient are petroleum products, lumber, raw cotton, and machinery. There are also some exports of small bulk and high value, such as tobacco, but the total export tonnage is twice as great as the tonnage of imports. Much shipping space must therefore return to America from the Orient in ballast or seek cargo in other regions.

Trade of the United States with Southern Asia.—With the exception of the Philippine Islands, the political divisions of the whole Indian Ocean trade region having the largest trade with the United States are the colonial possessions of European powers. Under this relationship the mother countries are the sources from which the colonies obtain a large part of their imports, mainly manufactured wares. Equal competition in this market by the United States is prevented by tariffs. (There is nothing, however, to prevent the United States from making large purchases in this region; vegetable fibers, mineral ores, rubber, hides, tea, spices, oils, and gums are all important commodities obtained from that part of the world.) Not The most important exports to the region are petroleum products and manufactures of iron and steel. From this region of the world, as well as from Middle America, the tonnage of American imports is normally greater than the tonnage of American exports to the region. To it go ships returning empty from other trade regions in search of cargo for American ports. The value of American imports, due to the high value of some of the commodities, is more than twice as great as the value of the export trade to southern Asia.

The Trade of the United States with Australia and West and South Africa is, relatively, small, representing about 3 per cent of the total foreign trade of the United States. The European populations of both these regions are small and the many political divisions included are under the commercial domination of European powers. Thus the foreign trade of Australia and New Zealand is predominantly with Britain and other N.B.

British possessions. Nevertheless, the need of these regions for American timber, petroleum, iron ware, and machinery enables American exports to these regions to outweigh the tonnage of imports from them several times and to have also a higher total value.

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CHAPTER XVII

THE UNITED STATES IN THE PACIFIC

Omit,

Changes Since 1898.—Since 1898 the interests of the United States in the Pacific have increased greatly. The first battle of the Spanish-American War was Dewey's naval victory in Manila Bay, in the Philippine Islands. As soon as this war began, the Hawaiian Islands, which had previously been refused annexation to the United States, were promptly taken over with the consent of their people, and later became a territory of the United States. Certain small islands, including Guam and a few of the Samoan group, have also been annexed. At the end of the Spanish-American War, Spain was compelled to release the Philippine Islands, and their control was taken over by the United States with a promise that the islands should be given independence as soon as they were prepared to assume it. The increasing economic importance of Alaska, the building of the Panama Canal, and our friendly attitude toward the struggling republic of China have still further increased the interest of the United States in the affairs of the Pacific (Fig. 140).

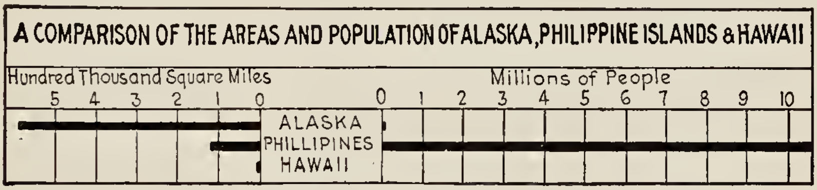

Fig. 140.

ALASKA

An Undeveloped Territory.—The purchase of Alaska from Russia in 1867 increased the territory of the United States by nearly one-fifth. Although Alaska has made notable economic progress in certain particulars in the last two decades it is still generally undeveloped. Its population (about 60,000, nearly half Indians and Eskimos) is less than it was in 1910. Its mineral and forest resources are for the most part unexploited, and the total extent of its lands now under actual cultivation is about half that of an average township in Iowa. Various factors have contributed to this slow development, not the least of which are the geographical situation of Alaska, its climate and its topography.

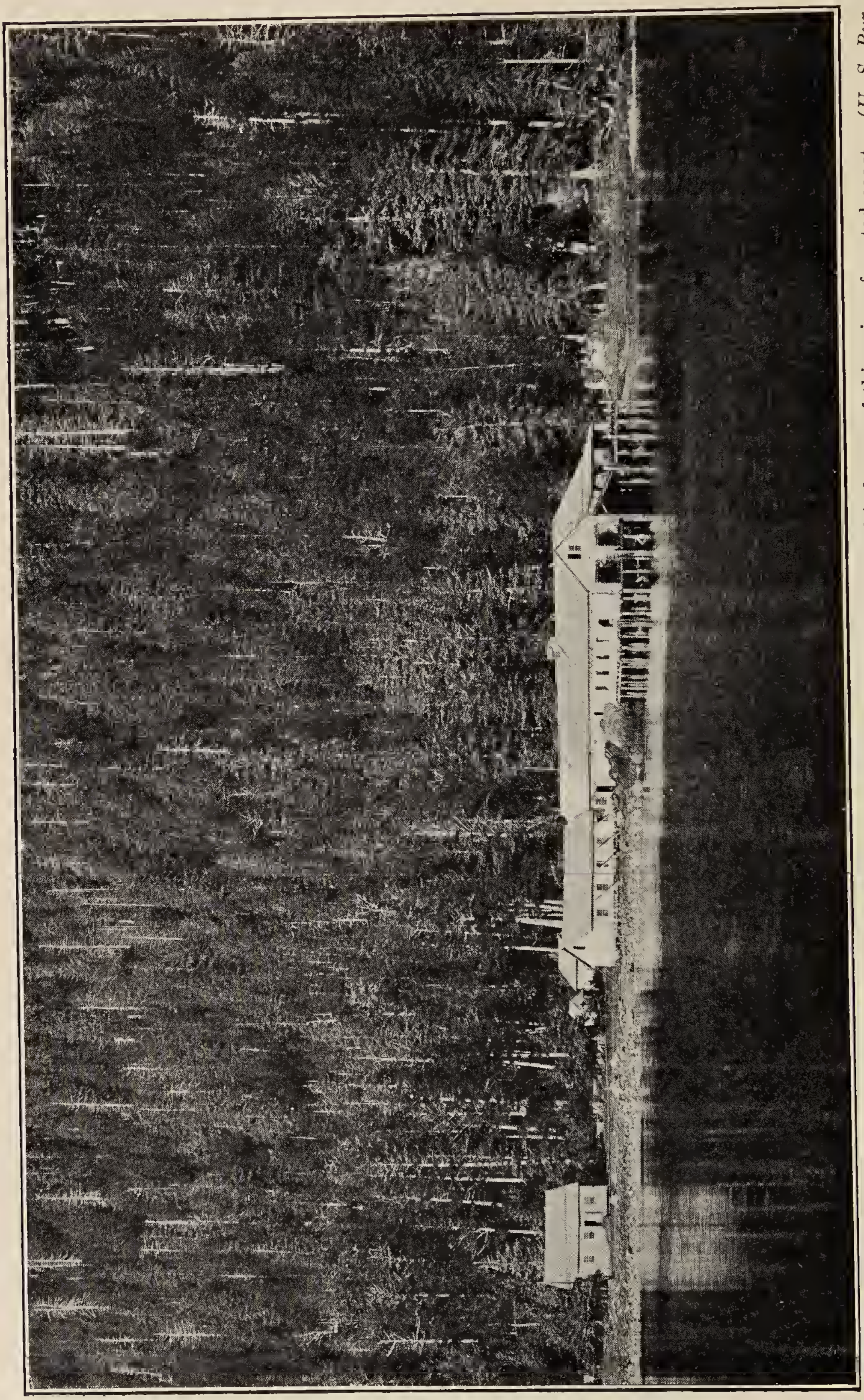

Fig. 141.—A salmon cannery on the coast of Alaska. Canning salmon is the principal industry of this rainy, forested coast. (*U. S. Bur. Fisheries.*)

Regional Contrasts in Alaska.—*The Pacific Coast section of Alaska* lies in the same latitude as Scotland and southern Norway, with which it has much in common in its fiorded and mountainous coasts and its marine climate. The annual precipitation of the region decreases with distance northward (it is 165 inches at the southern boundary), but on the seaward slope it is everywhere ample for the maintenance of forests. The combination of mountains, wet, chill climate, forests, and long distance to profitable markets has not encouraged agricultural settlement (Fig. 141). Little has been done even in the exploitation of the forests, since the more readily accessible timber of British Columbia lies between the Alaskan forests and the markets which their products must reach. Two large government forest reserves, including most of the merchantable timber, have been created and it is probable that in the future the forest resources will be in increasing demand (Fig. 61). However, much of the forest growth is likely to prove valuable as a source of pulp wood rather than as a source of saw timber. Most of the coastal settlements of Alaska are established in connection with the fishing industry, or serve as gateways to the mineral regions of the interior.

The Interior of Alaska.—Between the Alaskan Mountains on the south and the Endicott Range on the north lies the great interior of Alaska. It consists principally of the basin of the Yukon and the lesser basin of the Kuskokwim River. Although the topography of interior Alaska is much more level than is that of the coastal region, the rainfall is less and the extremes of temperature are greater. Here the forests are not extensive and the timber is not generally suitable for lumber.

The long and relatively warm summer days of the Alaskan interior permit some agricultural crops to be grown, including potatoes, hay, and cereals, though the summer is short and there is danger from early frosts. Beef and dairy cattle, sheep, and swine also are successfully kept. Yet agriculture cannot be said to thrive for the region is isolated from all but the local market and the white population of the whole interior is not more than that of a good-sized village in the United States.

Northern Alaska is mainly treeless. The summers are neither so warm nor are the winters so cold as in the interior, yet the ground is deeply frozen and summer heat serves to thaw only the surface, upon which moss and grasses are the principal vegetation. In this region, and in parts of the interior, the range is suitable for the reindeer, and the area has an estimated carrying capacity of from 9 to 10 million head, though the number of reindeer is now only about 500,000 The industry is new, and most of the usable area is without people or convenient means of transportation; hence the existing reindeer industry is located near the coast. At present the possibility of marketing reindeer meat in the United States is limited to the refrigerator capacity of the few steamers which reach Nome or other Bering Sea ports (about 450 tons).

The Mineral Resources of Alaska.—Alaska is rich in minerals In the past the placer gold of the Yukon and of Nome attracted a large but temporary population. The most easily won placer gold is apparently about worked out; however, less accessible placers and deep mining will furnish additional supplies, but at higher cost. Large deposits of copper are known and several properties are developed under the control of American copper companies, the largest of which provides its own transportation to the smelter on Puget Sound. Up to 1928 the value of gold and copper taken from Alaska by American companies was about 80 times as much as the United States paid Russia for the entire territory. Coal of various grades is found in the southern mountains; it furnishes fuel for local and for railway use, yet more than half the coal used in Alaska comes from outside the Territory, especially from British Columbia.

Alaskan Fisheries and Furs.—The sea yields to Alaska greater returns than all of its land resources combined (Fig. 142). Of the sea resources the salmon fisheries are most important (see page 149). There are in addition minor catches of halibut, cod, and the products of the whaling industry in Alaskan waters. Alaska is notable also for the catches of fur seals made on the Pribilof Islands. This industry, once so nearly ruined by ruthless slaughter of the animals, is now reestablished under government protection and yields a return of more than half a million dollars annually. This sum is, however, but one-eighth the value of the lynx, fox skins and other furs taken on the Alaskan mainland.

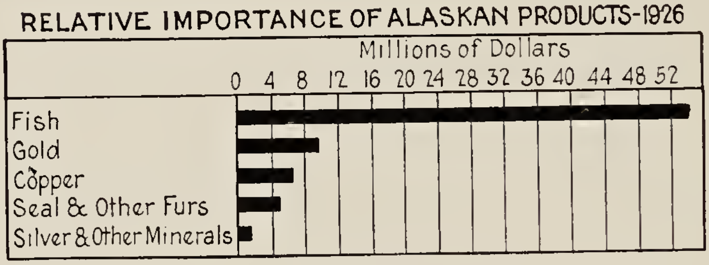

FIG. 142.

The Problem of Transportation.—Transportation difficulties arising from the location of Alaska, from its topography, and from its long winters are not easily overcome. Communication with the rest of North America is mainly by water. Railways total less than 700 miles; a few lines extend from the ports short distances inland, but one that the United States government has built from the south coast across the mountains to connect with the river routes of the interior at Fairbanks is over 500 miles in length. The Yukon and Kuskokwim rivers offer many hundreds of miles of navigable waterways through which the interior is now reached, yet they are open to boats only 3½ months during the year. The frozen condition of the ground makes permanent road construction difficult and dogs, used as work animals, outnumber horses 12 to 1, for dog and reindeer sledges must serve the principal needs for transport in the interior during the winter.

THE HAWAIIAN ISLANDS

The Location and Topography of the Islands.—The Hawaiian group consists of a number of volcanic islands situated in mid-Pacific just within the tropics. This situation is significant in connection with agricultural products and the commercial and political relations of the islands. (1) Tradewind climate and mountainous topography combined provide the northeastern slopes of the islands with abundant precipitation, but leave the southern and western slopes in need of irrigation. The development of agriculture under these conditions requires large financial outlay. (2) The central situation of the islands in the North Pacific makes of their principal port, Honolulu, a meeting point for Pacific interests and a cross-roads of traffic. The situation is one of strategic importance for nations on both sides of the ocean. It also invites Asiatic immigration; the population of 256,000 is more than half Asiatic and less than 10 per cent native Hawaiian.

The development of modern agriculture in Hawaii called for outside capital. Since both the necessary capital and the market for Hawaiian products were in the United States, the situation of Hawaii invited American control. The result was the annexation of the islands by the United States in 1898 at the request of the Hawaiian people.

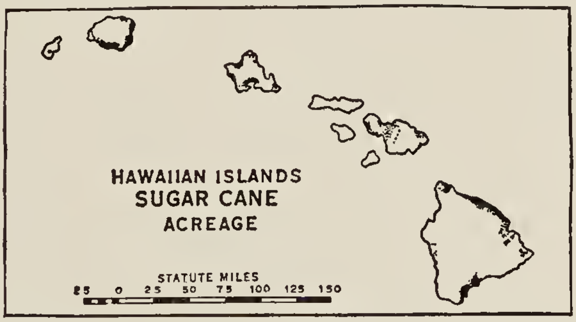

Fig. 143.—Sugar cane is grown on the windward (east) coasts without irrigation; on the leeward slopes irrigation is necessary. (*U. S. Dept. Agr.*)

The Hawaiian Sugar Industry.—Only 10 per cent of the area of the Territory of Hawaii is improved farm land. Much of the total area is dry, mountainous, forest-covered, or composed of barren lava flows. A large part of the unimproved land is held in farms, but serves only as pasture. Sugar cane is the most important cultivated crop in the islands; in 1927 it occupied 29 per cent of the improved land and contributed 65 per cent of the total crop value. Sugar is grown on the rainy tradewind

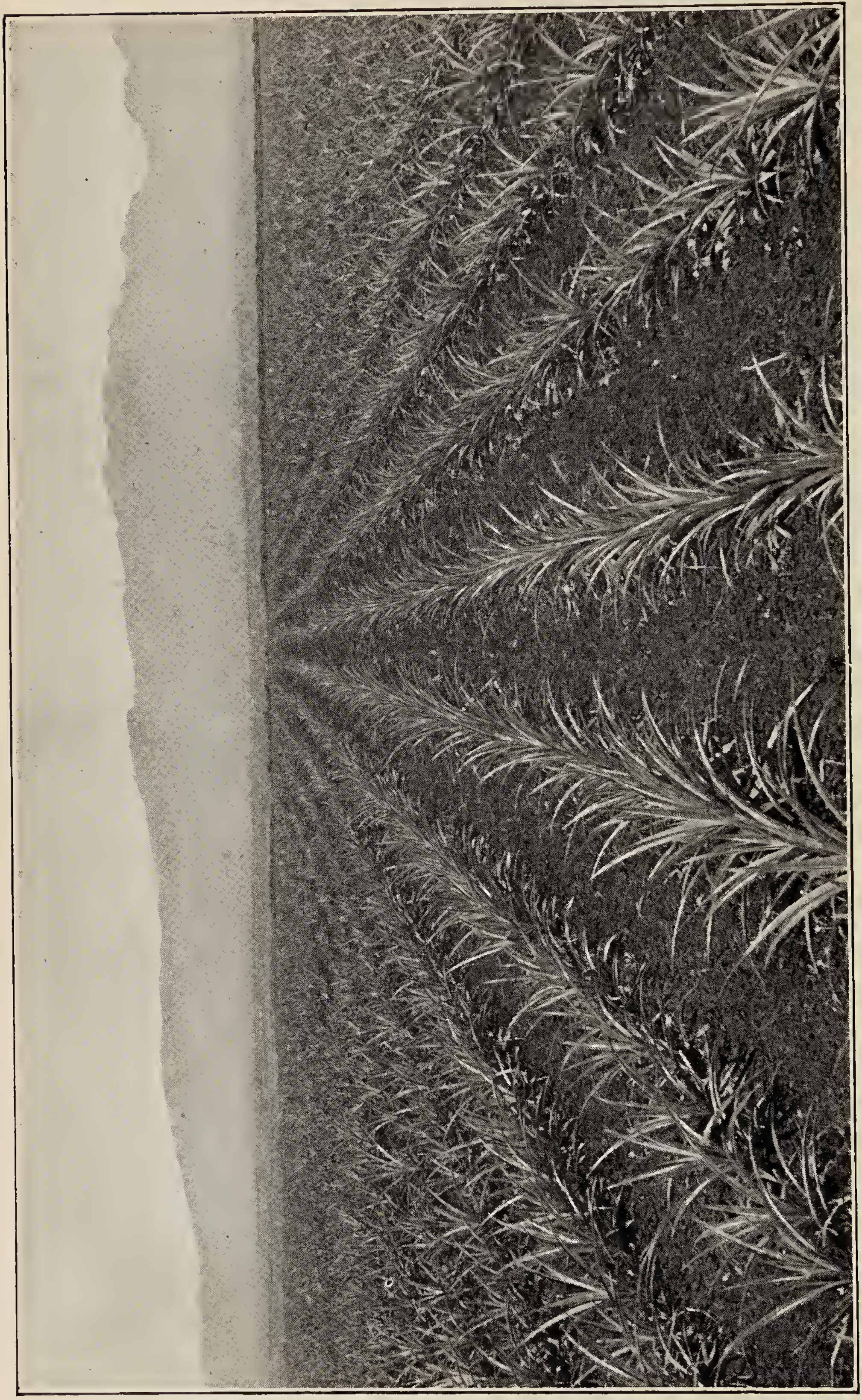

FIG. 144.—A field of young pineapple plants in the Hawaiian Islands. (*Erving Galloway*)

coasts without irrigation, but much larger yields are obtained under irrigation on the leeward coasts (Fig. 143). In some instances the irrigation water is carried from the rainy eastern slopes through tunnels to the dry lands on the west. The soils of the lower levels used for sugar production are mixtures of weathered lavas with coral lime. To these favorable soil conditions provided by nature are added heavy applications of Chile nitrate, and large yields of sugar result. The large expenditures for irrigation and for fertilizer often involved in Hawaiian sugar culture do not favor small-scale cultivation and large plantations, each with its own sugar mill, are the rule. The labor is provided mainly by the Asiatic immigrants, while the ownership and management of the plantations are in American hands and the raw sugar is shipped to refineries in the United States.

Other Hawaiian Crops.—The pineapple crop grown without irrigation, mainly in Oahu, ranks next to sugar in value (Fig. 144). The perishable nature of the pineapple does not permit its export to the United States in fresh form, though many are obtained from Cuba. The Hawaiian crop is canned (200 million cans a year), making economical use of local sugar (Fig. 145). Other fruits are grown for local use and there is some attempt to raise bananas for the Pacific Coast market. Rice and corn are the most important grain crops, but the quantities raised are not sufficient for the local needs, and food for the laborers is imported. The value of the annual exports of the islands is about $650 per capita of the population, an exceedingly high figure; this illustrates the great producing power of tropical lands when outside capital and management make production possible on a large scale.

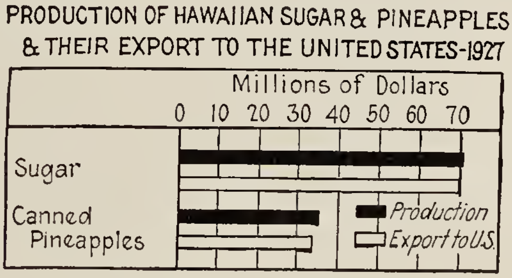

Fig. 145.

The Philippine Islands

The Islands and Their People.—The Philippine group consists of several thousand islands and islets, eleven of which are large enough to be of importance. The two main islands, Luzon and Mindanao, are each as large as a state like Indiana, and the entire archipelago has an area approximately equal to that of the British Isles or Japan, and a population of about 10 millions. The islands are mountainous and are wholly within the tropics, north of the equator. The people of the islands are somewhat diverse, speaking several different languages and dialects, adhering to different religions, and differing widely in the stages of civilization which they have attained. The great majority, however, belong to the same Malay stock—a brown people who invaded and conquered the islands long ago. Spain was in control of the Philippines for 350 years and Spanish continues to be the principal language of the educated class, although English is steadily gaining through the several thousand public schools which the American government in the Philippines brought into existence. At present the islands are nearly but not fully self-governing. Nearly all the officials are elected by the people, but the governor and vice-governor are appointed by the President of the United States. The Philippines have made remarkable progress since 1900 and a considerable part of the people are desirous of obtaining independence as soon as possible.

The Natural Resources.—Large parts of the islands are clad in forests owned by the government and comprising many species of tropical woods of commercial value. Relatively little is definitely known of the possible mineral wealth of the archipelago, but there are reasons for believing that it may be considerable. Among the known minerals are coal, iron, gold, and copper, but the actual mineral production is small, reaching a few million dollars annually, which represents perhaps 2 per cent of the value of agricultural products. The one outstanding resource of the islands is their agricultural land from which most of the wealth is being derived. If agriculture in the Philippines could be developed as it is in Porto Rico or Hawaii the output would reach many hundreds of millions of dollars annually; but the distance of the Philippines from the markets of the United States is a retarding factor.

Agriculture in the Philippines.—From 10 to 12 per cent of the land of the islands is under cultivation; this is equal to the cultivated area in one of our smaller states such as Maryland, yet the annual value of the products is large. Much the greater part of the population is engaged in agriculture which is carried on rather crudely, but less crudely than formerly.

Rice is the main crop and chief food of the people, but not enough is raised to supply the needs, and imports are necessary.

Corn ranks next to rice in acreage among the food crops.

Abaca, or manila hemp is one of the coarse fibers used for making cordage, and is produced almost solely in the Philippines. It is the chief money crop of the small farmers and is one of the principal exports (Fig. 146).

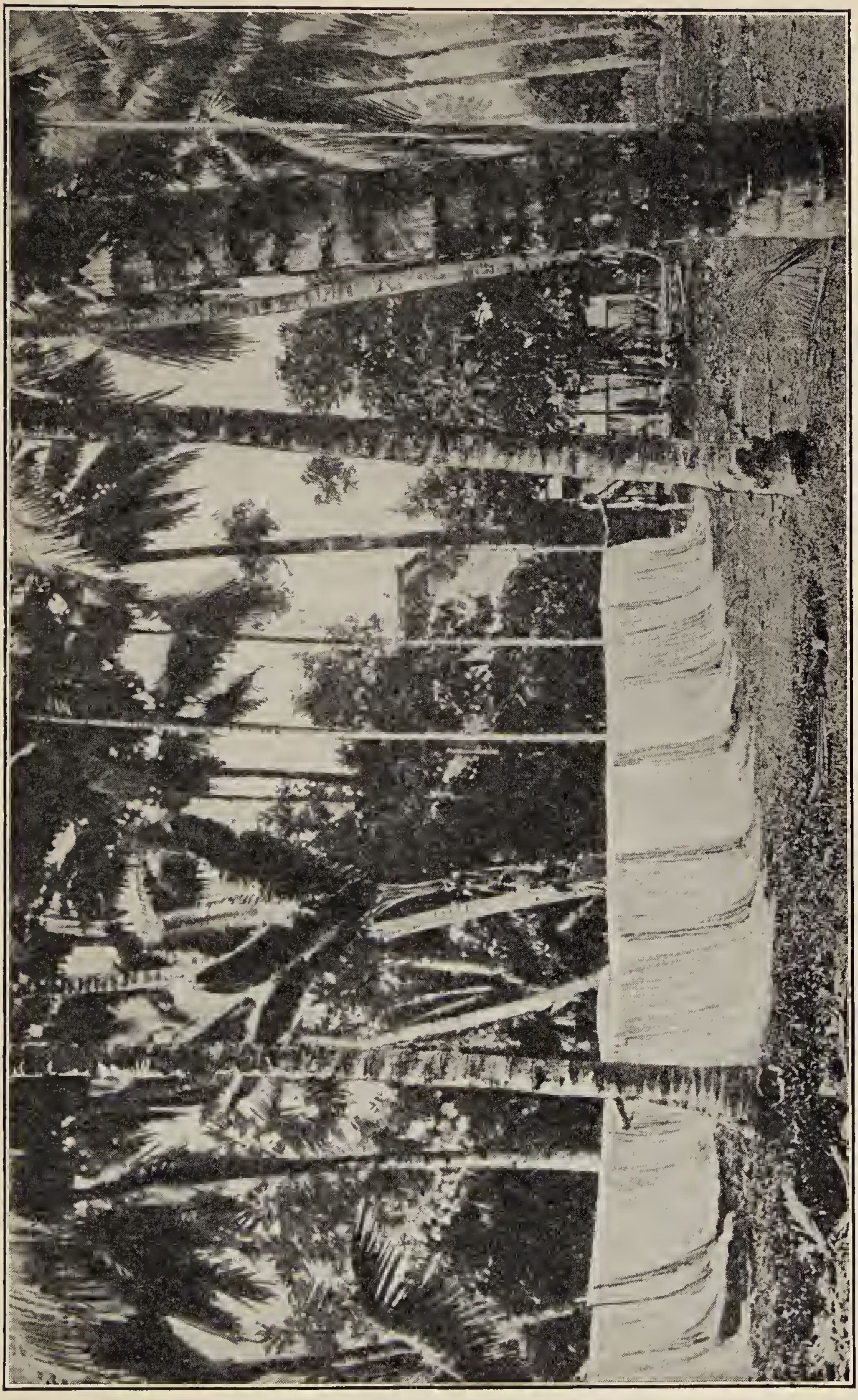

FIG. 146.—Abaca (Manila) fiber drying in a grove of coconut palms; two of the important agricultural crops of the Philippine Islands. (*U. S. Dept. Agr.*)

Coconut products, including copra and coconut oil, form another of the five leading exports, and the Philippines are one of the largest exporters of these products (Fig. 147).

Cane Sugar.—Owing to the distance of the Philippines from Europe and the United States, the islands are not so well situated for marketing sugar as are Hawaii, Porto Rico, or Cuba, yet sugar has become one of the most important products and exports. Considerable American capital has already gone into sugar production in the islands and will continue to do so if there is assurance of good government (Fig. 148).

Tobacco is one of the lesser products.

Livestock consists mainly of cattle and water buffalo. The latter are used in large numbers in the wet lands of the rice fields and are essential to this the leading industry of the islands.

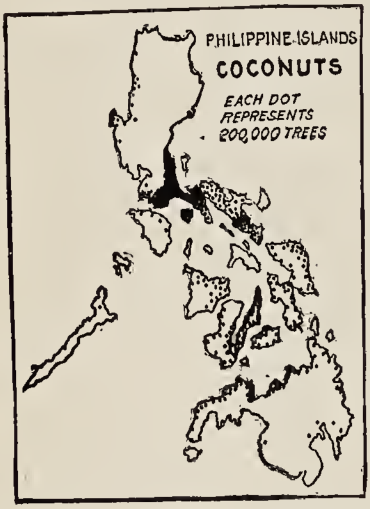

Fig. 147.—Coconut oil is one of the leading agricultural products of the Philippine Islands.

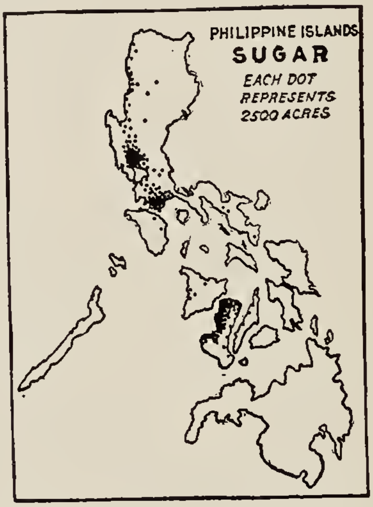

Fig. 148.—Sugar, one of the leading crops of the Philippines, is raised for home use and for export.

Manufacturing, Transportation, and Commerce in the Philippines.—*Manufacturing* has made notable progress since the American occupation. For example, in 1910 there was only 1 sugar mill of the modern type; in 1923 there were over 30. Upwards of 30 modern oil mills for pressing out the oil of the coconut have been established and there are over 100 cigar and cigarette factories. It is not to be understood that the Filipinos are in any sense a manufacturing people, for they are not. The manufactures are in the main those which are necessary to reduce such native products as sugar, coconuts, abaca, to marketable form.

Transportation.—The Philippines have upwards of 6,000 miles of public roads and 800 miles of railroads. Since the population is distributed over many islands, a large part of the movement of people and products must be by water, rendering railroads less essential than in continental countries.

Commerce.—The overseas commerce of the Philippines has increased very greatly under American rule, averaging more than 250 million dollars. Over three-fifths of the trade is with the United States (Fig. 149). It is notable that the per capita value of exports from Hawaii is more than 10 times as great as that from the Philippines. The value of the principal products and of the exports to the United States is indicated by Figure 150.

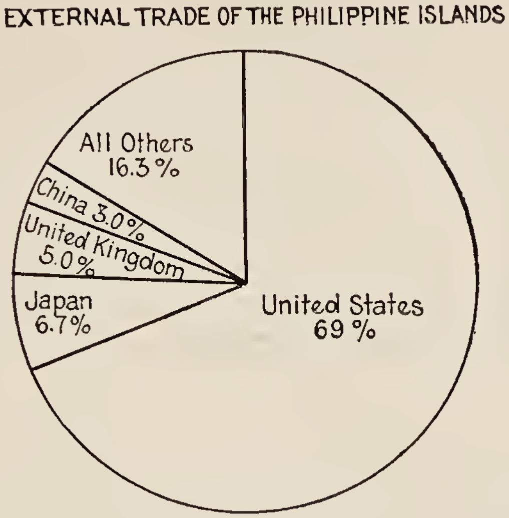

FIG. 149.

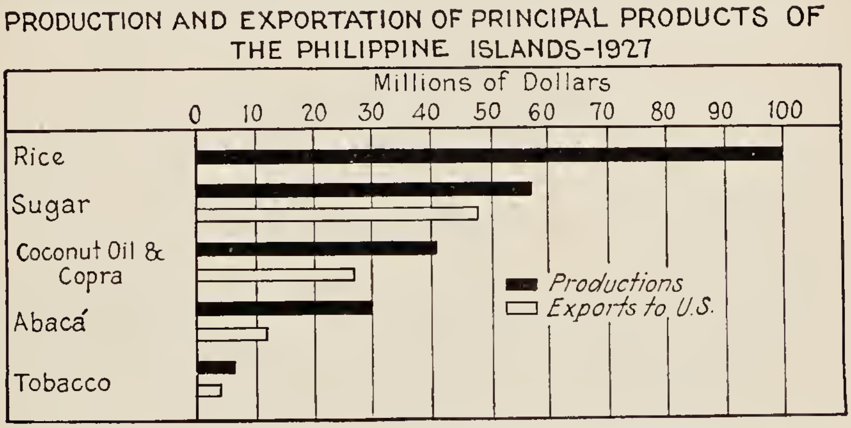

FIG. 150.—Note that the principal crop of the islands is entirely consumed at home, while the second crop is mostly exported.

OTHER ISLANDS BELONGING TO THE UNITED STATES

Guam, lying 1,500 miles east of the Philippines, has an area of 225 square miles and a population of 15,000. It has an American naval station, a powerful radio station, and a cable station of one of the trans-pacific lines.

Wake is a small island between Hawaii and Guam.

The Midway islands are a small group northwest of Hawaii, forming a relay station on one of the Pacific cables.

Amercian Samoa consists of 4 small islands of the Samoan group lying between Hawaii and Australia. The population is only about 8,000, but the habor of Pago Pago is one of the best in the Pacific and is an important base of the United States navy.

Baker and **Howland** are two tiny islands in the mid-Pacific near the equator, but are of no special importance.

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CHAPTER XVIII

CANADA—*A Summary*

A Summary for Canada Desirable.—In the foregoing chapters Canada and Newfoundland have been treated as integral parts of North America considered as one large economic region. Their physical and climatic features, their agriculture, and their other industries have been described in connection with the features of similar nature in the United States. However, the importance of Canada as a *political* unit recommends that the essential facts of its economic geography be brought together in a separate chapter.

A Large Area with Small Population.—Canada and Newfoundland include a total area greater than that of the United States and Alaska, but they have a human population no greater than that of New York State alone. The principal reasons for this condition may not be attributed to youth or to lack of political organization, for Canada has a history as long and a political government as favorable to economic development as are those of the United States. The great differences in the degrees of settlement and development of the two countries are to be attributed in large part to features of natural environment.

Canadian Agriculture

Consequences of Topography and of Latitude.—Most of Canada lies north of the parallel of 49° N. This fact alone would not seriously retard the economic development of the country; all of the North Sea and Baltic countries of Europe are in similar situation. Canada has, in addition, an unfortunate arrangement of topographic features. The Cordilleran highland is an effective barrier against the moderating climatic influence of the Pacific Ocean and, in consequence, the great interior of the country has the extremes of continental climate. In only limited areas outside of the Maritime Provinces, southern Ontario, and the coast of British Columbia, does the frostless season exceed 100 days. On the northern margin of the cereal zone of west central Canada the summer days are considerably longer than they are in the United States. In spite of this advantage, however, there is a large part of northern Canada in which the growing season is so short as to discourage any general dependence upon the cereal crops, and much of the extreme north is tundra, only the surface of which thaws out during the brief summer. As in the High Plains of the United States, the crops of the western Prairie Provinces frequently suffer from lack of rainfall.

Consequences of the Character and Distribution of Soils.—The glaciated crystalline rocks of the Laurentian Upland have, in general, insufficient soil for agriculture. Over large areas the surface is covered with a scanty soil capable of supporting only forests, which are interspersed with lakes, bogs, and numberless patches of bare and polished rock (Fig. 151). Isolated areas of considerable extent, such as the "clay belt" of northern Ontario, are known to have soils suitable for tillage, yet their very isolation, coupled with climatic handicaps, causes their development to be slow. The principal regions of agricultural land are therefore in (1) the Maritime Provinces, (2) the St. Lawrence lowland and southern Ontario, (3) the southern part of the Prairie Provinces, and (4) in the valleys of the Cordilleran and Pacific Coast regions. The most extensive of these regions is that of the Prairie Provinces, in which, however, the northward expansion of agriculture is limited by the shortness of the growing season. There is now little permanent agriculture north of Peace River Crossing (56° 15′ N.) (see Fig. 1, page 10).

The cultivated land of Canada is about 4 per cent of the total area of the country, as compared with nearly 20 per cent in the United States. The total acreage put to any agricultural or pastoral use is less than 5 per cent of Canada; in the United States 50 per cent is used. Nothing could show more strikingly the slow development of regions with pronounced geographical handicaps for agriculture, so long as cheap land in better situations remains available elsewhere. The most desirable land of North America is now occupied, and we may watch with interest to see how rapidly the pressure of the world's population upon the total food supply and the resultant rise of food prices will encourage farmers to endure the hardships and to take the risks of loss incident to the development of the cold frontier of agriculture in countries like Canada and Siberia.

Canada's Agricultural Regions Widely Separated.—The southward extension of the Laurentian Upland to the Great Lakes, and the highland of the Cordilleran region, divide Canada's agricultural lands into three widely separated parts. Between the farm lands of southern Ontario and those of Manitoba lies an expanse of nearly 800 miles of land, mainly uninhabited and almost unproductive of agricultural crops. Between the grain fields of Alberta and the farms or ranches of the Pacific Coast valleys is a mountain barrier. It is clear that Canadian agriculture is faced with a peculiar problem in transportation.

Agriculture in Eastern Canada.—That part of Canada which lies east of the Great Lakes contains about 75 per cent of the entire population of the country, and 7 of the 10 largest cities of the Dominion. The

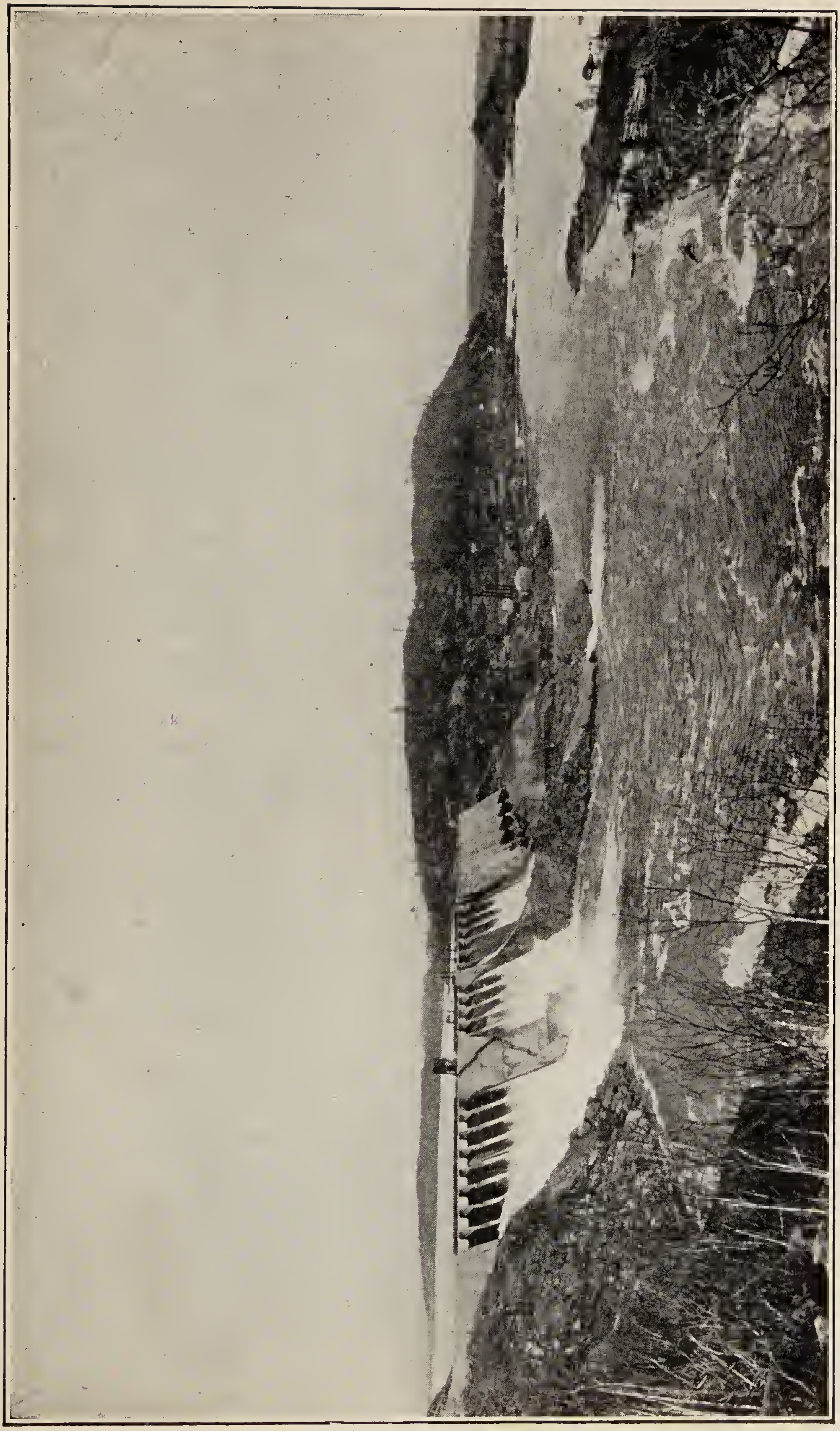

FIG. 151.—The glaciated surface of the Laurentian Upland yields little but timber and furs; the glacially disturbed drainage with its lakes and falls offers large resources in waterpower. (*Courtesy Ontario Dept. of Mines*).

markets. clim. crop

produce of this region has easy access also to the great industrial markets of the United States and of Europe. The humid, continental climate is favorable to pasture, hay crops, and, among the cereals, oats. This combination of climate, crops, and markets has led to the development of dairying, particularly for the manufacture of butter and cheese (Figs. 81, 83, and 84), which are of high quality and compete for the American and English markets. Only in the southern tip of peninsular Ontario is corn an important crop, and here only do swine approach the numbers per square mile found in the American corn belt (Fig. 76). As an adjunct to the dairy industry they are, however, fairly numerous throughout the St. Lawrence Valley.

In a few places where the rigorous conditions of continental climate are moderated by marine or lake influence, fruits are grown in commercial quantities. The Annapolis Valley of Nova Scotia, the Montreal district, and the northern shores of Lakes Ontario and Erie are noted apple regions (Fig. 32). The Niagara Peninsula successfully produces less hardy fruits, particularly grapes and peaches.

Agriculture in the Prairie Provinces.—The great expanses of the treeless Prairie Provinces are given over almost entirely to the cereals and to a limited amount of grazing (Fig. 12). On these rich soils, and under relatively low rainfall, wheat, barley, and flaxseed, mainly spring-sown, provide crops which can stand the cost of shipment to the distant markets of the United States or of Europe, while oats provide grain for local feeding. In these crops the interest of the people centers. Grain elevators dot the level landscape and many of the villages are little more than houses clustered about the elevator, the railway station, and the country store.

Prior to the coming of the grain farmer, cattle and sheep grazed the open ranges of the Prairie Provinces. The ranges are now mainly divided into farms, except in the sections of low rainfall. Yet grazing continues to be important and meat packing plants operate in some of the larger towns. Many of the Canadian cattle are shipped also to Chicago and other cities in the United States for slaughter.

Agriculture in British Columbia is confined mainly to limited mountain valleys and to the Pacific slope. It is more like that of eastern Canada than that of the neighboring province of Alberta. The abundant rainfall and mild temperatures of the Fraser River Valley and of Vancouver Island encourage dairying and the production of small fruits. In the Okanogan and other of the dry mountain valleys apples are grown, as in Washington, with the aid of irrigation. The settled lands are confined to the extreme southern portion of the province. The "dry belt" of the intermontane plateau is a cattle grazing region of some importance. Although some good land is found farther north, it is heavily forested and settlement is preceeding slowly.

Okanogan valley — [illegible] fruit. [illegible] irrigation

Fuel and Power in Canada

Coal.—Canada is unfortunate in the geographic relation of her most densely peopled industrial district to her own coal fields. In peninsular Ontario the sedimentary rocks which underlie the surface include the earlier Paleozoics up to, but not including, those of the coal age, which lie to the east in Pennsylvania and to the west in Michigan. The industrial region of Ontario is therefore dependent upon coal imported from these nearby fields of the United States.

Canada has, however, a large reserve of coal, three-fourths of which is lignite. Large areas of black lignite are found in the Prairie Provinces (Fig. 94) and it is mined for local consumption. Some of it approaches bituminous coal in quality. Valuable deposits of high-grade coals are found in three widely separated regions: (1) Nova Scotia and New Brunswick, (2) the Rocky Mountain margin of Alberta and British Columbia, and (3) Vancouver Island. From each of these three regions coal is exported to the adjacent districts of the United States which are without coal and some is exported as steamship fuel. (The total coal production of Canada averages less than 17 million tons, about one-half of the amount consumed in the country.) Its value is however, three times that of the nickel output of Canada and it constitutes about one-fourth of the value of all mineral substances produced in the country.

N.B.

N.B.

Small quantities of petroleum and natural gas are obtained in southern Ontario and in Alberta. The total petroleum output of Canada is, however, only about one-twentieth of 1 per cent that of the United States.

Water Power.—The St. Lawrence Valley and southern Ontario are as fortunate in their possesion of water power as they are unfortunate in their lack of coal (Fig. 106). The two provinces, Quebec and Ontario, have an installed capacity of nearly 2 million horsepower—five-sixths of all of the developed water power in Canada. This is equal to more than one-fifth of that of the entire United States. This large water power is due to (1) the geological structure of the region and the interruptions of drainage due to glaciation, resulting in Niagara Falls and the many falls and rapids which fringe the Laurentian Upland (2) the excellent conditions of water storage found in the Great Lakes and in the numberless glacial lakes and swamps and in the forest floor of the Laurentain Upland, (3) the abundant and well-distributed annual precipitation of eastern Canada. It is believed that Canada has for the future nearly eight times as much water power as is now developed. Nearly two-thirds of these undeveloped powers are in Quebec and Ontario, while Manitoba and British Columbia have most of the remainder.

RAW MATERIALS AND MANUFACTURING

Iron and Steel.—The amount and distribution of the iron ores of Canada are, as in the case of coal, unfortunate for the industrial development of the country. In spite of the fact that the most valuable deposits of iron ore in the United States lie on the margin of the Laurentian Upland (Lake Superior region), the known resources in similar situations on the Canadian side of the international boundary are almost negligible in quantity. (A comparatively small quantity of Newfoundland ore is shipped to the coal of Cape Breton Island, Nova Scotia, and is smelted mainly at Sydney. Some of this ore is exported also to the United States and to Europe.)

In British Columbia some small bodies of ore are mined and smelted with the local coal. This iron is, however, too far distant from the Canadian industrial centers to be of much significance to the national manufactures, though a market for it may develop in Japan. Blast furnaces in Ontario, at Sault Ste. Marie, Port Colborne, Hamilton, and at some other points, are so situated that Lake Superior ore is easily obtained from the United States by boat. In general the iron and steel industries of Canada employ both imported raw materials and fuel.

Other mineral industries of importance, most of which have been previously mentioned, are located in various parts of Canada. In the mountain region of eastern Canada is asbestos, and, in the Laurentian Upland of Ontario are the nickel and copper deposits of Sudbury, the silver of Cobalt and the even more valuable gold resources of the Porcupine, Red Lake and other newly discovered gold fields. In British Columbia lead and copper are the most valuable metals, yet the amount produced is not large.

tos-Que
kel &
per-Sudbury
er Cobalt
-Porcupine
& Copper
B.C

Forests an Important Basis of Industry.—The forests of Canada rank second only to the soil in value as a natural resource. The general character and distribution of these forests has been previously described (page 114). The quantity of timber which they originally contained and, indeed, their present value are not accurately known. (It is certain that, although vast areas of forested land remain, much of the best timber has fallen under the axe or has been destroyed by fire.) The advent of the paper pulp industry has created a market for a large part of the Canadian forests which were not valuable for lumber. Of the better timber, eastern Canada now has but little for export, and hardwoods for certain industries are even now imported. The forests of British Columbia, however, produce lumber for export to the Orient and to other markets.

Manufacturing Industries.—Canada has made great industrial progress in recent years. The nature and location of the industries reflect (1) an abundance of agricultural raw materials requiring manufacture, (2) great forest resources, (3) the water powers of Ontario and

Abundance of water power
[illegible]
Protective tariff

Quebec, and (4) the non-geographic factor of a protective tariff on many classes of manufactured wares.

B. (The principal centers of manufacturing industry are in the upper St. Lawrence Valley and peninsular Ontario.) Ontario alone turns out more than one-half of all the manufactured wares of Canada, while Ontario and Quebec together are to be credited with fully three-fourths of the total.

Figure 152 indicates the relative importance of the leading classes of manufacturing industries of Canada measured in terms of (1) the number of wage earners employed and (2) their value-product in 1925. Although the lumbering and wood-working industries employ almost as many workers, the value of their industrial products is not nearly so great as that of the food-preparing industries in which the most important items are contributed by flour and grist mill products, slaughtering and meat packing, and the manufacture of dairy products.

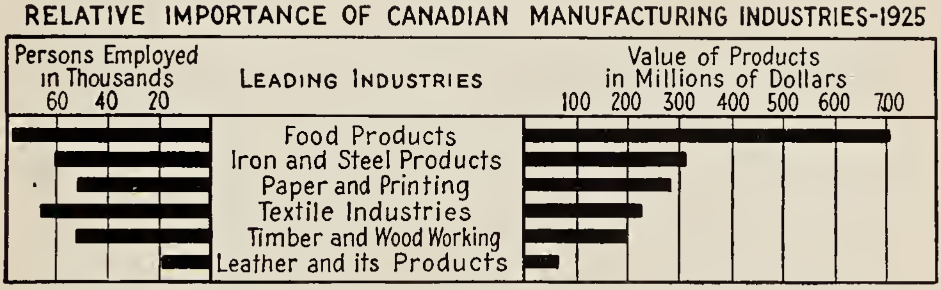

FIG. 152.—The manufacture of farm products into finished products employs more people and yields much greater values than any other industry in Canada.

It is not likely that Canadian manufactures of iron and steel, with their geographical handicaps arising from lack of both coal and iron, could compete with wares of similar sort from the United States were it not for a protective tariff. (Many such industries now established in Canada are branches of concerns located in the United States.) This is notably true of automobile manufacture.

Canadian Fisheries.—About 15 out of every 1,000 persons in Canada are employed in some phase of the fishing or fish preserving industry. The total products of the industry average nearly 50 millions of dollars per year, an amount somewhat greater than the value of the cheese made in Canada. Nearly one-third of the total value of the Canadian fishery products is contributed by the salmon fisheries of the Pacific Coast. Including halibut and other fish caught on this coast, British Columbia is credited with about half of the total value of the Dominion fisheries. 1 Sal fisher

Next in importance are the cod fisheries of eastern Canada. Although cod are caught by Canadian fishermen on the Grand Banks, many are taken in the shore waters also, particularly in the Gulf of St. Lawrence. 2 Cod fisheri

Other kinds of fish are caught in the same waters, and the in-shore fisheries employ many more men than do those of the off-shore type. The value of the fish taken in the Great Lakes and in other inland waters of Canada is less than one-sixth that of the products of the salt water fisheries.

Little more than one-third of the products of Canadian fisheries are required for domestic use. Efficient railway service permits fish to be sent fresh from both east and west into the interior, but the market is not large. The United States is the largest foreign market and takes nearly as much as is consumed in Canada. The United Kingdom is also a large buyer of Canadian fish. Canned salmon, salt and dried cod, and other varieties of cured and preserved fish are sent to many countries, particularly to the West Indies and to Mediterranean Europe (Fig. 153).

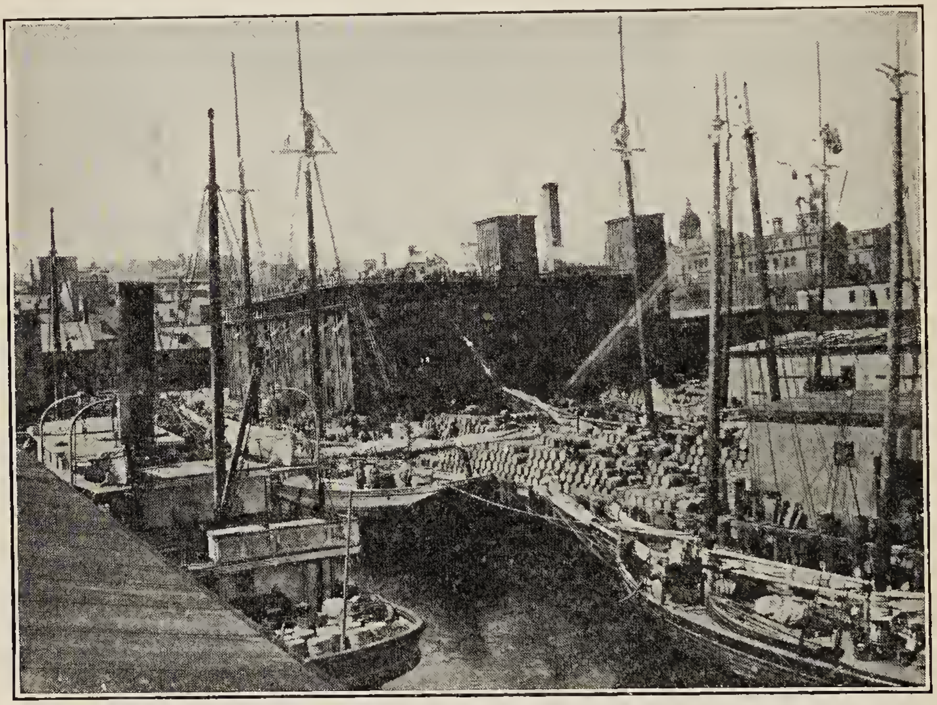

Fig. 153.—Shipments of Canadian preserved fish awaiting transportation on the wharves at Halifax, Nova Scotia.

Furs and the Fur Trade.—It has previously been noted that conditions of physical environment in Canada favor the growth and capture of fur-bearing animals. In more than half of Canada this is still the principal industry; the trading posts or "factories" of the Hudson's Bay Company are established at strategic points on the lakes and rivers of Northern Canada as marketing points for the trappers, most of whom are Indians. Some of these posts have seen generations of service with but little change in the regions of which they are the centers. The total population of the trapping region is small and its productiveness is slight in proportion to its great size. The sale value of the entire Canadian fur catch of the winter of 1925–26 (15 million dollars) was for example hardly one-fifth the total value of the American orange crop.

CANADA'S TRANSPORTATION PROBLEM

Canadian Waterways.—The waterways of Canada have been of vital importance to the development of the country from its earliest history. The dense forests of the east were penetrable through the water route of the St. Lawrence. The Great Lakes led explorers to the far interior of the continent and the streams of the Laurentian Upland made the fur trade possible. So exclusively were the rivers the avenues of communication in early Canada that each inhabitant was granted land which had at least a narrow stream frontage. River transportation remains the sole means of communication in a large part of northern Canada. The canoe, the scow, the York boat, and the steamer are the carriers of people and goods on many hundreds of miles of waterways tributary to the Arctic Ocean and to Hudson Bay.

The most used waterways of Canada are, however, the St. Lawrence River and the Great Lakes. Due to the estuarine character of the river it has, by some improvement, been made navigable for large ocean vessels as far as Montreal. Canals extend navigation for boats of 14-foot draught around the rapids and falls up to lakes Ontario and Erie, beyond which Great Lakes transportation reaches to Port Arthur, 2,000 miles from the Atlantic. The usefulness of this as well as the other waterways of Canada is greatly decreased by the long season during which they are closed by ice.

Canadian Railway.—The problem involved in the connecting of the long, narrow, and interrupted strip of settled Canada by means of railways has been previously mentioned. The construction of some of the Canadian railways has been so hazardous from the financial viewpoint that the Dominion government felt called upon to do what private capital was afraid to risk. Railways constructed by the government, or taken over subsequently and united into the Canadian National Railways, now constitute more than half of the entire mileage of the country. Most of the remaining mileage is comprised within the powerful Canadian Pacific system.

The difficulty of linking together the great expanses of Canada with their comparatively small populations is shown by the fact that while every 1,000 people in the United States must support 2.5 miles of railway the same number of Canadians must support 4.25 miles. That is a large financial burden, rates are high, and many of the individual roads show deficits annually.

The Foreign Trade of Canada

The Direction of Canadian Trade.—The geographic factors of greatest influence in Canadian trade are those creating dissimilarity between the Provinces and giving rise to interprovincial trade. This, like the interstate trade in the United States, is much more important than the foreign trade. Second in importance is Canada's nearness to the United States. More than half of Canada's imports come from the United States and over a third of her exports come to this country (Fig. 154). Third in importance among the factors affecting the direction of Canadian trade are her political, economic, and geographic relationships with Great Britain. More than one-fifth of the foreign trade is with the mother country.

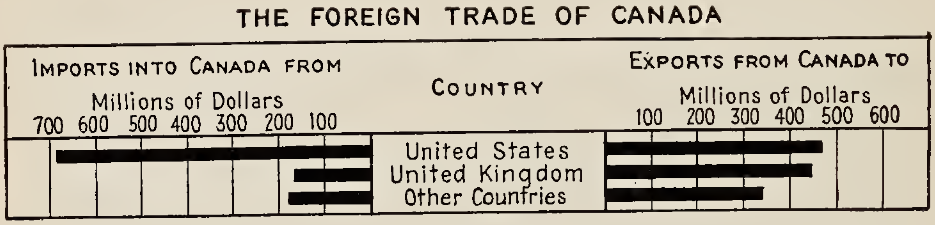

Fig. 154.—Geographical proximity to the United States is the most important single influence upon Canada's foreign trade.

The Character of Canadian Foreign Trade.—Under pre-war conditions Canada, although a young nation and a producer of raw materials and foods, had an unfavorable balance of trade. Expensive constructional materials and equipment required for the material development of the country caused the value of imports to exceed that of commodities exported. The extreme industrial effort of the war period and the great demand for Canadian foods changed this situation, and a favorable balance of trade is still maintained. The total value of the foreign trade exceeds 2¼ billions of dollars.

The principal items imported into Canada are those required in industry: iron and steel, coal, raw cotton, wool, and silk. Sugar, fruits, and other foods which do not grow in Canadian climates are also important. N.B. Wheat is much the most valuable of Canadian exports. Next in importance are wood and wood products. Wheat and flour, wood, pulp, Note and paper combined comprise about one-half of the total exports.

Canadian Ports.—The importance of the port of Montreal in the commercial life of Canada has been noted. Through its harbor flows about one-fifth of the total foreign trade of the Dominion. Doubtless the amount would be greater were it not for the handicap of winter ice. This difficulty is met by prolonged rail carriage into the ice-free ports of the East, St. John, N. B., and Halifax, N. S. In part also the winter exports move in bond through the United States and out of ports as far south as Baltimore.

Vancouver is the principal Pacific port of Canada. Prince Rupert, the northern Pacific terminus of the Canadian National Railway, has but a very small trade. The foreign trade which passed through Vancouver in 1927 exceeded that of St. John but was hardly one-half that of Montreal.

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PART II

THE WORLD OUTSIDE OF THE UNITED STATES AND CANADA

CHAPTER XIX

MEXICO AND THE CARIBBEAN LANDS

The Growing Commercial Importance of the Region.—The lands bordering on the Gulf of Mexico and the Caribbean Sea—often called the American Mediterranean—are of increasing importance to the United States, partly because of the opening of the Panama Canal and partly because of our growing interest in the commerce of this part of the world.

In the tropical rain-forest and savanna climates of the lowlands frost is almost unknown and crops grow the year around in soil that has been enriched by the age-long decay of tropical vegetation. A majority of the island people are of colored or mixed racial stock; the negroes are the descendants of former slaves, and the greater part of the people of the mainland are Indians or a mixture of Indian and white. Everywhere there are more or less white people, but with the exception of Cuba and Porto Rico they are in the minority, and in the island of Haiti there are scarcely any whites.

The Caribbean region is capable of producing great quantities of tropical products; for example, the sugar-producing ability of the region, now mainly confined to the West Indies, is almost unlimited. The banana plantations, mostly on the southern and western shores of the Caribbean, are sending us shiploads of fruit every day, a million bunches a week. (Coffee is the chief crop of the highlands of Central America and northern South America up to a height of 5,000 feet.) The coast lands of the Caribbean are capable of producing great quantities of coconuts whose meat and oil are in increasing demand. The Mexican petroleum fields near the Gulf have yielded enormously, and Venezuela has risen to second place among the oil-producing countries. There are promising oil possibilities in Central America, Colombia, and Trinidad. The mineral wealth of the Mexican Plateau is very large and varied and minerals are likely to remain the chief group of exports from Mexico.

The ability of the Caribbean countries to buy American goods is in direct proportion to their ability to sell their products to the United States, and this country can absorb them in great quantities. The productivity of the region can be increased many fold by the introduction of modern methods of large-scale production such as have been applied to sugar in Cuba, to coffee in Brazil, and to bananas in Central America.

MEXICO

Present Conditions.—Mexico has more potential agricultural land than Germany or France and is possessed of greater mineral wealth than either. It is situated favorably for commerce, facing on both of the important commercial oceans, and is neighbor to the greatest industrial nation in the world. Yet, its agriculture does not supply sufficient food for its own people; its mines—largely controlled by foreigners—yield far below their possibilities; its foreign trade is less than that of Cuba, which is only one-sixteenth the size; its total manufacturing output amounts to less than that of a good-sized American city; and the great majority of its 15 million people are poor, illiterate, and neglected. In spite of its great natural wealth, favorable situation, and relatively large population, Mexico holds a minor place among the nations.

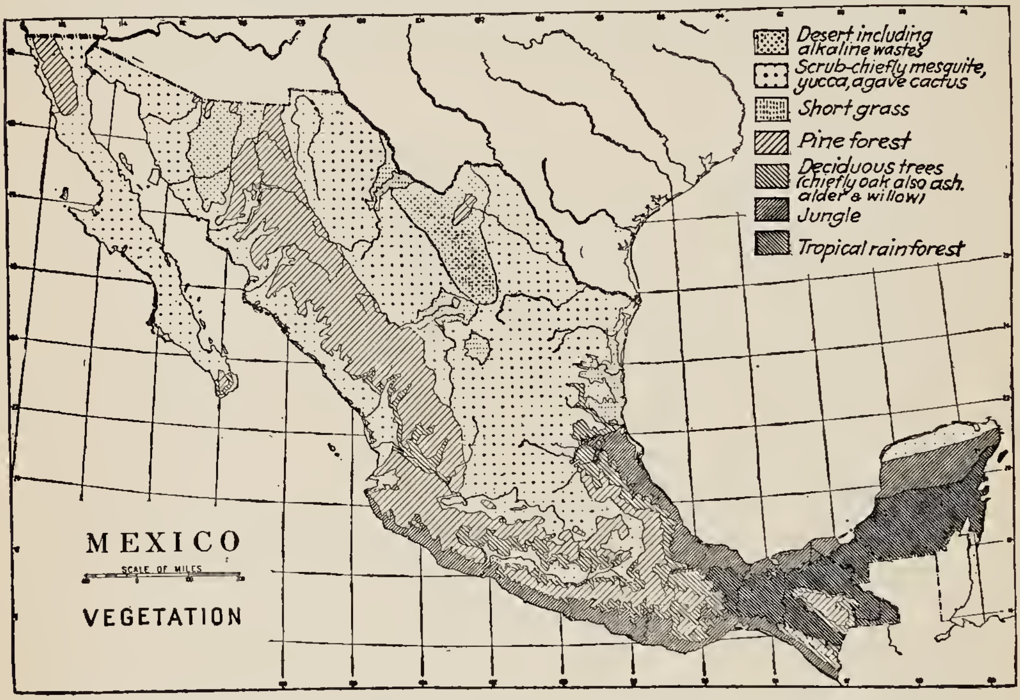

Desert including alkaline wastes
Scrub-chiefly mesquite, yucca, agave cactus
Short grass
Pine forest
Deciduous trees (chiefly oak also ash, alder & willow)
Jungle
Tropical rainforest
MEXICO
SCALE OF MILES
VEGETATION

Fig. 155.—The cross-lined areas (forests) show where the rain chiefly falls. (*From the Geographical Review, published by the American Geographical Society of New York, vol.* 11, *p.* 218).

Climate Conditions.—Mexico is one-fourth the size of the United States, but the northern part, like most of Arizona and New Mexico, is desert or near-desert, supporting only a scanty population (Fig. 155). Mining, grazing, limited agriculture, and smelting of minerals are the only industries of consequence. The Gulf coastal plain low, and jungle-covered, is oppressively hot and unhealthy. The plateau, in which is located the city of Mexico, is so high (6,000 to 8,000 feet) that, although it is within the tropics, the temperature is delightful, and upon it live three-fourths of the people of Mexico. On the whole, Mexican agriculture suffers from insufficient rainfall (Fig. 156), and the people suffer from the lack of ambition and energy which cold winters impart, but climate is not the chief reason for the backwardness of Mexico.

Poor Harbors and a Mountainous Topography.—The Gulf coast of Mexico has no first-class harbor. The harbors on the Pacific side are better, but as yet their commerce is small. Along the greater part of the coast, high, steep-walled mountains rise at no great distance from both shores, and make the building and operating of railroads to the interior both difficult and expensive; for example, the railroad from the principal port, Vera Cruz, to Mexico City climbs nearly 8,000 feet in the first hundred miles from the coast. These conditions make transportation expensive and retard the general progress of the country. But neither the poor harbors nor the mountainous topography are mainly responsible for the backwardness of Mexico.

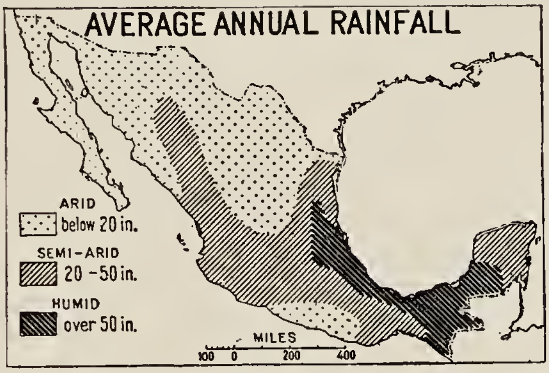


Fig. 156.—Nearly half of Mexico is desert or near-desert. (*From the Geographical Review, published by the American Geographical Society of New York, vol.* 11, *p.* 213).

The Mexican People and Government.—Only 10 or 15 per cent of the people are white; 30 to 40 per cent are Indians of at least 40 different tribes and languages; and 40 to 50 per cent are *mestizos*, a name applied in Latin America to persons of mixed white and Indian ancestry. The Indians, if not aroused, are a docile, ease-loving, unambitious people, satisfied with a mud hut, corn bread (*tortillas*) and beans, and petty gambling for excitement. Few are educated, yet occasionally one rises to prominence, as in the case of Benito Juárez, a president of the republic. They and a portion of the mestizos constitute the exploited and oppressed laboring class of Mexico, the *peons*. The mestizos form a higher class of laborers, shopkeepers, artisans, and small politicians; a few of them reach the class of professional men; in fact, Porfirio Diáz, Mexico's most renowned president, was a mestizo with a small admixture of Indian blood.

The white people are mainly the descendants of old Spanish families, who are, as a rule, educated, socially refined, and proud; they owned much of the property and held the great landed estates. These larger

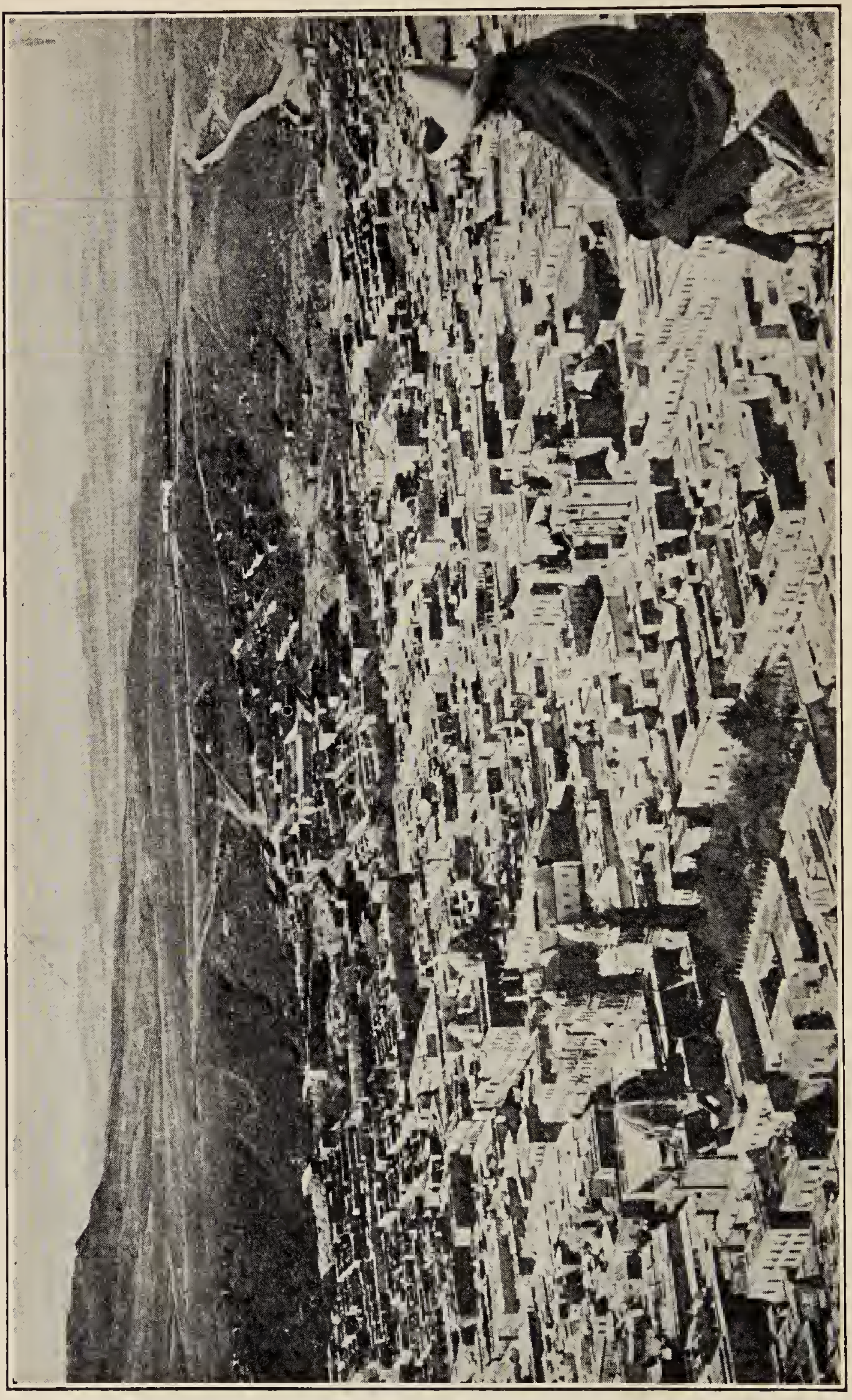


Fig. 157.—City of Zacatecas in the semi-arid plateau of Central Mexico. (*Copyright Keystone View Co.*)

land holdings are being subdivided and a part of the land is being turned over to the peons. Elections often have been a farce and a revolution is sometimes the only way to displace the party in power; hence revolutions are frequent. Herein lies the trouble with Mexico; a vast majority of illiterate, irresponsible Indians and mestizos are under the leadership of first one political faction and then of another. They are unable to develop the vast resources of the country, unable to conduct a republican form of government, and incapable of working together very long for the national welfare.

Foreign capital built the railroads, operates most of the mines and smelters, and is producing over 85 per cent of the exports. More than a billion dollars of American money is invested in Mexico, yet it is a risky investment and great losses have been sustained. It is undoubtedly true that foreign corporations have often dealt unfairly with the Mexicans, and these corporations may deserve some of the dislike which they have incurred.

Agricultural and Grazing Land.—Mexico is nearly four times as large as France, but only 5 to 10 per cent of the land is well suited to agriculture. Much of the land, held in great estates, is poorly managed and wretchedly cultivated. Under efficient modern methods Mexico could produce several times its present value of crops. Corn is the most important food product, and along with beans, wheat, and tobacco, grows on the plateau. Coffee grows on the lower mountain slopes, cotton mainly on irrigated lands in the north, and vanilla beans in the humid lowlands; a variety of other crops are grown, but the agricultural exports are small; food products make up scarcely 10 per cent of the total exports of the country. Many millions of acres—especially in the drier portion of the country—are or might be used for grazing cattle and sheep (Fig. 155). Tens of thousands of acres on the plateau are devoted to the growing of a species of the century plant from which *pulque,* the national alcoholic drink, is made.

Henequen.—In the peninsula of Yucatan is an area devoted to growing *henequen,* a plant from which the fiber known as "sisal," or "sisal hemp" is obtained. These plantations cover thousands of acres and the yearly value of the sisal exported reaches 15 million dollars. The fiber is chiefly employed in making binder twine used in the binding of grain into bundles by harvesting machinery; 85 per cent of the world's supply of binder twine is made from the henequen of Yucatan.

The Mineral Wealth.—Mexico is a storehouse of minerals—petroleum, copper, silver, lead, zinc, gold, and others. Many of the mountains are volcanic and this partly accounts for the wealth of minerals. Mexico is the leading producer of silver in the world; for a decade was the second largest producer of petroleum, and is an important producer of copper and lead.

The petroleum fields are near the Gulf coast and were marvelous producers. The rise in production of this oil field was exceedingly rapid (Fig. 158). One well yielded 25,000 barrels a day for many years; another yielded 100 million barrels in eight years. So great has been the yield of oil that at times it could not be taken care of, and wells had to be plugged to prevent the flow. After 1922 production declined rapidly to a quarter of its former output.

The greater part of the copper mined in Mexico comes from the region not far from the Arizona and California border, and is controlled by three strong companies, two of which are American. In fact, the greater part of the mining and smelting is done by American corporations. Large iron deposits exist, but only a little is mined, mainly because the coal for smelting it is not at hand. Coal of low grade is found in Mexico, but the amount is small. Mineral products constitute about 85 per cent of the exports of the country, and the greater part of these come to the United States.

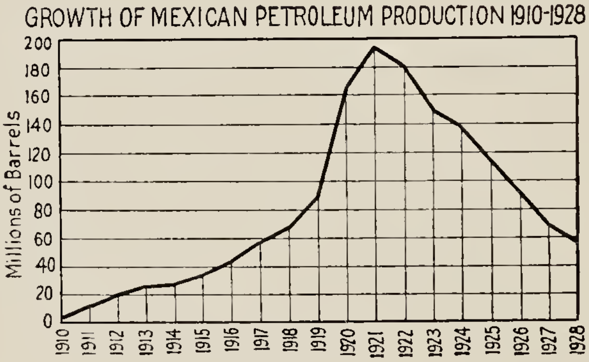
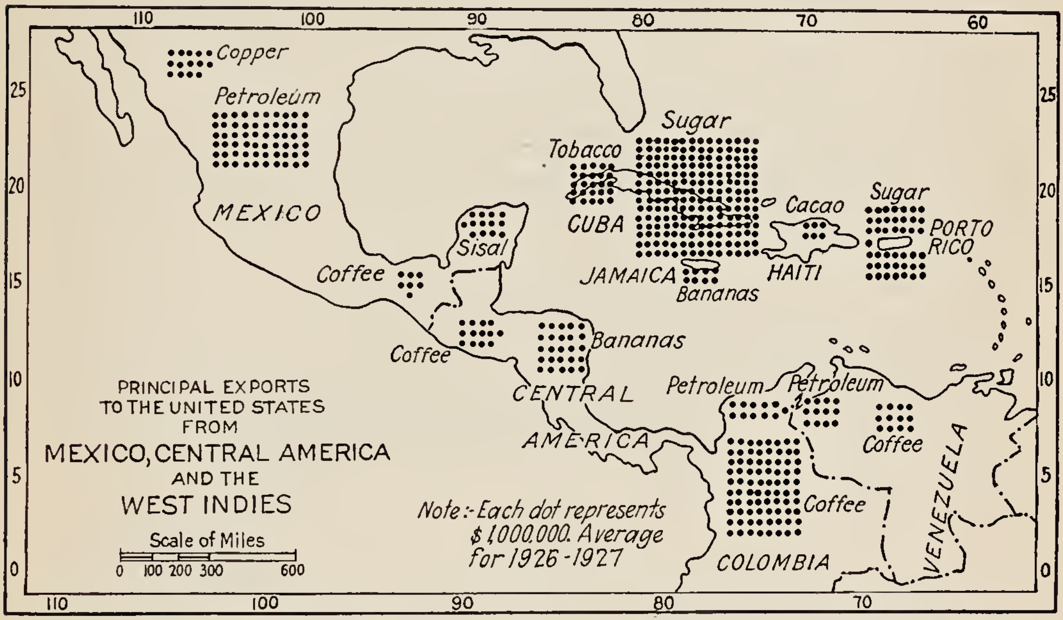


Fig. 158.

Other Economic Activities of the Mexicans.—Manufacturing made some progress in times of law and order, but is still relatively unimportant. Good roads are rare but are on the increase. The railroad mileage is about equal to that of Texas (16,000 miles); it is largely, but not wholly, controlled by the government, and much of it is in bad condition. About 8 per cent of the country (mostly in the south) has forests of tropical woods. including mahogany, but only a small amount is cut.

The foreign trade depends considerably upon political conditions within the country, for revolutions and banditry are ruinous to industry. The total foreign trade is fairly large because of the mineral production, and exports exceed imports in value. Chiefly on account of nearness, the United States controls more than 70 per cent of the foreign trade of the country.

Summary.—The generally unhappy condition of Mexico is only partially due to an unfavorable geographical environment. Climate, natural resources, and geographical location are as favorable as the average among nations. Mexico might be a country of influence were it not for the bad political and social conditions which exist. The white minority include people of highest refinement and intelligence, but they have thus far been unable either to govern their country or to develop its great natural wealth.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Copper
Petroleum
MEXICO
Coffee
Sisal
Coffee
Tobacco
Sugar
CUBA
JAMAICA
Bananas
Cacao
HAITI
Sugar
PORTO RICO
Bananas
CENTRAL AMERICA
Petroleum
Petroleum
Coffee
Coffee
COLOMBIA
VENEZUELA
PRINCIPAL EXPORTS TO THE UNITED STATES FROM
MEXICO, CENTRAL AMERICA AND THE WEST INDIES
Scale of Miles
0 100 200 300 600
Note:- Each dot represents $1,000,000. Average for 1926-1927

Fig. 159.—Note the importance of sugar from Cuba in comparison with any other product from the Caribbean region.

THE WEST INDIES

Principal Islands and Groups of Islands.—The West Indies include (1) the Greater Antilles—Cuba, Haiti, Porto Rico, and Jamaica; (2) the Bahamas, and (3) the Lesser Antilles, consisting of a number of groups of small islands (Fig. 164). The West Indies are the projecting portions of a mountain range rising above the sea. All the islands are or have been colonies of European powers. The two largest—Cuba and Haiti—have become independent, and Porto Rico, belongs to the United States.

The Climate.—The climate of the West Indies has four well-marked characteristics.

1. During the winter, the region is under the influence of the steady, invigorating northeast tradewinds; little rain falls, and the climate is delightful.

2. During the summer the tradewinds diminish in strength, the weather is oppressively sultry, and rainfall is heavy.

3. The range of temperature throughout the year is small, the hottest month being only 10 or 15 degrees warmer than the coolest; this is true generally of islands in the tropics.

4. With plenty of rainfall and no cold season, crops grow throughout the year.

History.—The first land discovered by Columbus in the new world was in the West Indies, to which his sailing vessels were brought by the tradewinds. Most of the islands have been colonies of Spain, but Great Britain, France, Holland, Denmark, and the United States gained possession of them. Large numbers of African slaves were brought in to work the plantations; the planters became very prosperous and fortunes were made, especially from sugar. At one period the West Indian colonies were rated as more important than the mainland of North America. The abolition of slavery temporarily put an end to the prosperity of the islands. Later, methods of large-scale production of sugar were perfected in Cuba and Porto Rico, and the smaller islands of the West Indies—unable to compete with these islands—fell behind and have not fully recovered. The islands still belonging to European nations have much less relative importance as colonies than they once had. However, a prosperous future may be ahead of some of them if modern methods of production backed by large capital shall replace the uneconomical methods of the past.

Cuba

The Island.—Cuba is as large as Ohio and in length nearly equals the distance from New York to Chicago. The greater part of the surface consists of plains deeply covered with soil of great fertility. The coast has many harbors—deep, spacious, and usually pouch-shaped (Fig. 161); no part of the island is far from one of these harbors, and this aids greatly in the export of the sugar crop. Cuba has more agricultural land than Java with its 34 million people, and more than Japan with its 60 million people.

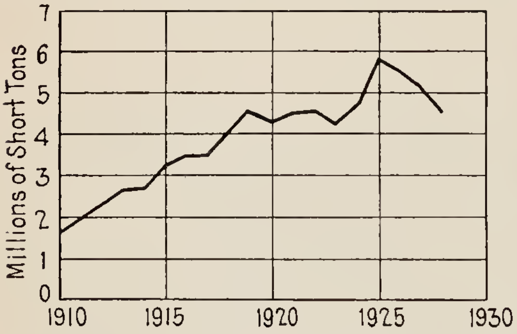


Fig. 160.—The production of sugar in Cuba increased more than 200 per cent from 1910 to 1925.

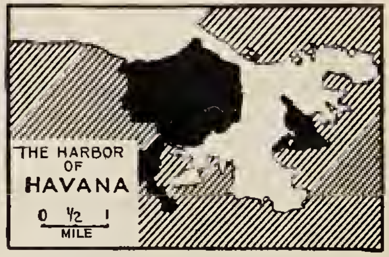


Fig. 161.—The excellent "bottle-necked" harbor of Havana. There are many of this sort on the coast of Cuba.

People and Government.—Of the 3 million people, 70 per cent are classed as white, though this percentage is undoubtedly too high. The colored people are descendants of former West Indian slaves; the white people are mainly of Spanish descent, and the Spanish language, customs, and style of architecture prevail. With the military aid of the United States, Cuba gained her independence in 1898 and became a republic. It is virtually but not entirely independent, for the United States has certain rights in Cuba, including the right to intervene in case of insurrection. Cuba has made great progress since 1900, but has recently suffered from the overproduction and low price of sugar.

CANE SUGAR PRODUCTION

Sugar cane is at its best within the tropics. Of the three countries which produce the bulk of the world's cane sugar, Cuba ranks first, followed by India and the island of Java in the East Indies (Fig. 162).

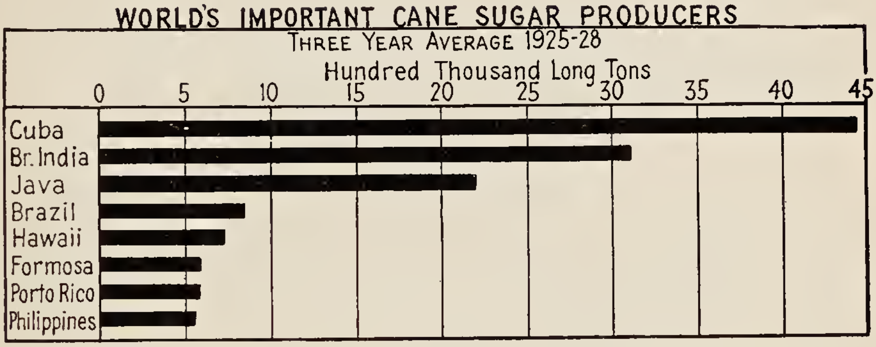


FIG. 162.

India consumes the sugar which it produces, leaving Cuba and Java the leading exporters; the Hawaiian Islands are also large exporters. Cuba has two advantages as a grower of cane: (1) soil and climate perfectly suited to the crop, and (2) nearness to the United States, the largest buyer of sugar in the world. Cuba's close political and financial relations with the United States have brought two further advantages to her sugar industry: (1) a preferential tariff in the United States in favor of Cuban sugar, and (2) the investment of hundreds of millions of dollars of American capital in Cuban plantations and sugar mills (Fig. 160). More than half of the total capital is American, one company having 20 sugar estates and mills. These great plantations with their tens of thousands of acres, scores of miles of railroad track, thousands of laborers, and expensive centrals (sugar mills) are business enterprises of the first order.

Recently cleared forest land yields the best sugar cane, so each estate owner tries to have a reserve of forest land which can be gradually cleared for new cane fields. The land must be plowed, harrowed, and furrowed. In the shallow furrows, or trenches, pieces of cane are laid and covered with earth. From these, new cane plants shoot up, growing in rows which are cultivated like corn. In about 15 months the cane is ready for the cutting, which begins about January 1 and progresses throughout the dry season and beyond, usually ending in June or July. From 5 to 10 crops can be cut from the same land without replanting. The cane is cut by hand; this calls for a large force of workers during the harvest season and there is always a shortage of labor.

The large estates have the mill located near the center—in fact the mill is called a "central." Railroad tracks lead from the central to various parts of the large plantations. The mill also grinds cane bought from independent growers. An acre of good cane yields 20 to 25 tons, from which 2 to 3 tons of sugar are extracted by grinding the cane, compressing it between powerful steel rollers to squeeze out the juice, and boiling this until the sugar crystallizes out. The raw sugar thus produced may be like our brown sugar or it may be nearly white. The 190 centrals in Cuba produce from 4 to 5 million tons a year, most of which is sent to the United States. If the plantation owner gets 2½ or 3 cents a pound for the raw sugar he can make a profit. During the war and immediately after fortunes were made in Cuba, for the price of raw sugar rose to 20 cents. Molasses is a by-product of the sugar mill. Some of it is sold for cooking purposes; a great deal is distilled to make rum and alcohol, and some is used in making a nutritious cattle food called "molassquite."

OTHER ECONOMIC ACTIVITIES

Tobacco.—Just west of Havana is a small but perfectly definite area about 90 miles long and 10 miles wide having a peculiar soil. Here is raised the tobacco leaf from which the genuine Havana cigars are made. This land is very expensive, and under intensive fertilizing and cultivation yields upwards of $1,000 worth of tobacco per acre. Less valuable leaf is raised in other parts of the island, yet the total export of tobacco is scarcely one-tenth the value of the sugar exported.

Minerals.—The only mineral known to exist in Cuba in large quantities is iron; in the eastern end of the island are actual mountains of iron ore situated near the sea. Cuba is estimated to have 4 billion tons of iron ore. The mines are controlled by an American corporation, and the ore goes in limited quantities to steel plants in eastern Maryland, for Cuba has no coal with which to smelt it. Copper, manganese, a small quantity of petroleum, and a few other minerals are produced, but Cuba's mineral industries are of small importance when compared with her agriculture.

Transportation, Manufacturing, and Foreign Trade.—Cuba has 1,500 miles of first-class roads leading into the principal cities, but the average country roads are poor. The railroad system is good, and consists of a central line extending almost the entire length of the island; from this, branch lines run to the principal ports (Fig. 160).

Aside from the production of raw sugar and the manufacture of tobacco, Cuba, like other tropical countries, does very little manufacturing. The foreign trade is large, in fact, one of the largest in proportion to the population of any nation. Sugar forms over 80 per cent of the exports, and 80 per cent of the exports go the the United States. About 60 per cent of the imports (largely manufactures) come from the United States. Cuba with 3 million people has a larger foreign trade than Mexico with 15 million people.

Haiti and the Dominican Republic

These two misgoverned republics constitute the island of Haiti, second largest island of the West Indies. The people of the Republic of Haiti are descended from Indians and former negro slaves. The Dominican Republic is often called a "mulatto republic" because a large proportion of the people, though colored, have white blood in their veins.

The island is mountainous, but the cultivable lands are fertile, and when given a chance, they yield abundantly. As in most of the West Indies, sugar is the principal crop in the Dominican Republic, while coffee leads the exports from Haiti. Roads were, until the American occupation between 1915 and 1922, almost non-existent, and there were very few schools; misgovernment, corruption, and insurrections were the rule. The Dominican Republic has 150 miles of public railroad, but Haiti has almost none.

Porto Rico

This island came into the possession of the United States in 1898 as a result of the Spanish-American War. Two-thirds of the 1½ million people are classed as whites, and the remainder are negroes and mulattoes. The island is a territory of the United States and in a large degree is self-governing, with a non-voting resident Commissioner in our House of Representatives. The Governor and a few other officials are appointed by the President of the United States.

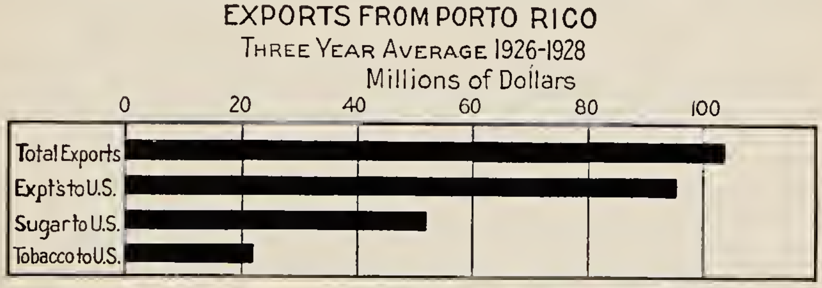


FIG. 163.—About 90 per cent of Porto Rico's exports go to the United States.

The island is mountainous, about half being under cultivation. Sixty per cent of the people are engaged in some form of agriculture. Sugar has become the most important crop, reaching a value of over $50,000,000 a year. Tobacco is second in importance to sugar, followed by coffee and fruits (Fig. 163).

The island has made wonderfully rapid gains since it came under American influence. There are upwards of a thousand miles of excellent roads, over 300 miles of railroad, a university, and over 1,600 school buildings. There are three good-sized cities, the largest (San Juan) having 75,000 people. Since American occupation, exports have increased over 600 per cent.

The American Virgin Islands

The Virgin Islands, 50 miles east of Porto Rico, consist of three small islands purchased from Denmark in 1916 for 25 million dollars. Their combined area is only 132 square miles and combined population 25,000. One of the islands (St. Thomas) has an excellent harbor, said to be valuable to the United States as a naval base.

The British West Indies

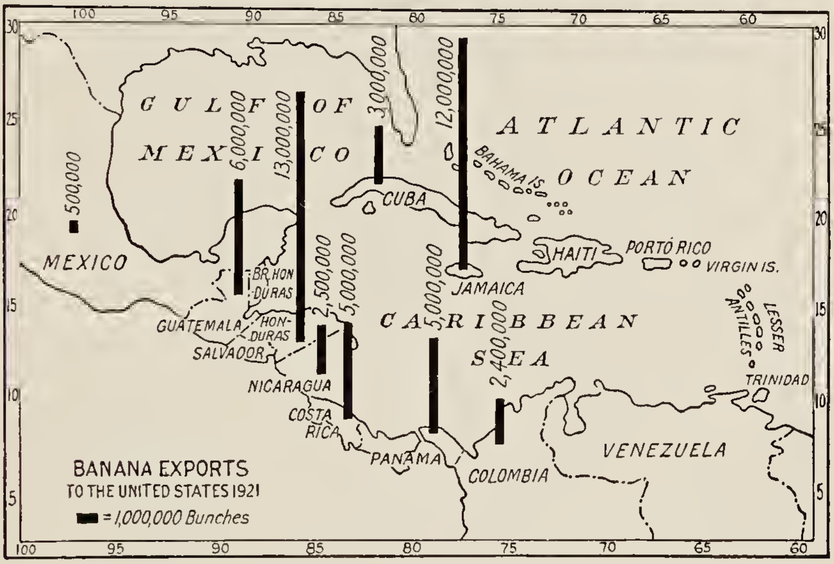
These include Jamaica and Trinidad—good-sized islands—the Bahamas, Barbados, the Leeward Islands, the Windward Islands, and several others. Jamaica has nearly a million people, all but about 15,000 of whom are colored. Trinidad is smaller than Jamaica but more prosperous. The islands are almost wholly agricultural, and sugar cane, cacao, bananas and coconuts are the most valuable crops. Barbados is very densely populated—over 1,000 people to the square mile. Trinidad has an asphalt lake which constantly fills from below as the hardened asphalt is removed from the top. This is one of our chief sources of natural asphalt. With the exception of years when tropical hurricanes have devasted Jamaica, bananas have been the largest export of that island. At times it has been the largest exporter of bananas in the world. In nearly all the West Indies, great quantities of rum are made from molasses and this constitutes one of the chief exports to Europe.

There are many good harbors among the British West Indies, the best of which is the important naval base at Kingston, Jamaica. The exports of these islands go more largely to the British Isles than elsewhere, but the imports come increasingly from the United States which is nearer and can supply goods more promptly. On the whole, the West Indian possessions of Great Britain and France cannot be said to be of very great advantage to the home countries.

CENTRAL AMERICA

Central America is made up of six small republics: Guatemala, Nicaragua, Salvador, Honduras, Costa Rica, Panama, and the little colony of British Honduras. The largest, Nicaragua, is the size of New York State, and the smallest, Salvador, the size of New Jersey. Guatemala, with the largest population, has about 2 millions, or fewer than Chicago. Altogether there are fewer people in these six nations than in New York City, and something like 85 or 90 per cent of them are Indians and mestizos. All the republics—with the possible exception of Panama and Costa Rica—are in weak financial condition, and a year seldom passes that an attempted revoultion or invasion does not occur in at least one of them. In each country there is one line of railroad, or possibly two. Most of the people live on the Pacific slope or on the plateau at altitudes of 1,000 to 4,000 feet, where the tropical climate is relieved by the altitude. On this slope coffee is the all-important crop, and is the only export of consequence.

On the lowlands of the Caribbean coast are many banana plantations, some of them covering thousands of acres. The largest plantations are owned by American companies—particularly by the United Fruit Company. Half of the bananas that enter the export trade of the world come from plantations on the eastern side of Central America (Fig. 164). So well does the banana industry of the Caribbean region exemplify the possibilities of tropical production under intelligent direction backed by adequate capital, that it merits special consideration.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GULF OF MEXICO
ATLANTIC OCEAN
CARIBBEAN SEA
MEXICO
BR. HONDURAS
GUATEMALA
HONDURAS
SALVADOR
NICARAGUA
COSTA RICA
PANAMA
COLOMBIA
VENEZUELA
CUBA
JAMAICA
HAITI
PORTO RICO
VIRGIN IS.
BAHAMA IS.
LESSER ANTILLES
TRINIDAD
500,000
6,000,000
13,000,000
3,000,000
12,000,000
2,500,000
5,000,000
5,000,000
2,400,000
BANANA EXPORTS
TO THE UNITED STATES 1921
▬ = 1,000,000 Bunches

FIG. 164.—The rise of the banana trade and the fleet of steamships connected with this trade have made a notable change in the commerce of the Caribbean region.

The Banana Industry of the Caribbean Region.—The banana is a nutritious food, easy to grow, inexpensive to ship, and the most convenient of all fruits to eat. Each banana plant or tree bears one bunch, then it is cut down and new plants spring up from the same base, and within 8 or 9 months each plant bears a new bunch containing from 100 to 150 bananas. The extension of banana plantations and the organization of the banana trade constitutes one of the best examples of modern business methods applied on a large scale to a tropical industry. While many companies are engaged in the industry, one American corporation in particular has expanded its activities until they touch nearly all of the Caribbean countries. It has banana plantations in Guatemala, Honduras, Costa Rica, Panama, Colombia, and Jamaica (Fig. 164). Being a perishable fruit, bananas must be handled skilfully and transported rapidly. Everything from the cutting of the stem of fruit in the tropics to its delivery to the retail dealer in the villages and cities of the United States must be done promptly and systematically. This has been achieved almost to perfection; and bananas that have traveled from South America or Central America are frequently sold in our cities as cheaply pound for pound as are apples.

The banana is at its best in low, alluvial lands where the soil is deep and rich, the rainfall heavy, and the temperature high. To be marketed quickly, the bananas must grow near the sea, and the great plantations are purposely located near harbors at which ocean-going steamships can load. Scores of miles of railroad—in some plantations hundreds of miles—reach from port back into the plantations on which from 3,000 to 4,000 colored laborers are employed under white superintendents. Modern steel and concrete wharves are equipped with special machinery by means of which 30,000 to 60,000 bunches of bananas can be loaded into the hold of a steamer in a single night. When the steamer reaches New Orleans, for example, special machinery unloads the fruit at a special wharf equipped for this particular trade, and ventilator cars take the fruit to any part of the country. Thus, by perfect organization, and by combining under one management the fruit-cutting, selecting, and inspecting, and the ownership of railroads, wharves and steamships, the banana industry of the Caribbean shows what can be done in the way of developing the tropics and utilizing their enormous food producing power.

The Panama Canal.—The United States began work on the Panama Canal in 1904 and ten years later opened it to the shipping of the world (Fig. 165). The total cost has somewhat exceeded 500 million dollars, which includes the cost of fortifications, docks, and port works. The canal is about 50 miles long, has three pairs of locks near each end, and is capable of floating the largest ships in use. All vessels traversing the canal pay tolls of $1.20 per net registered ton if they are laden, and somewhat less if they are in ballast. A moderate-sized freight boat of 5,000 tons, for example, pays $6,000 for each trip through the canal.

The traffic through the canal increased from about 4 million tons in 1915 to 28 million in 1928. Ships belonging to the United States make most use of the canal, and those of Great Britain rank second. A steadily increasing tonnage of freight is being carried by way of the canal from coast to coast of the United States, for the freight rates by this route are considerably less than the overland rates by railroad. The tolls are paying the cost of operation and maintenance of the canal and

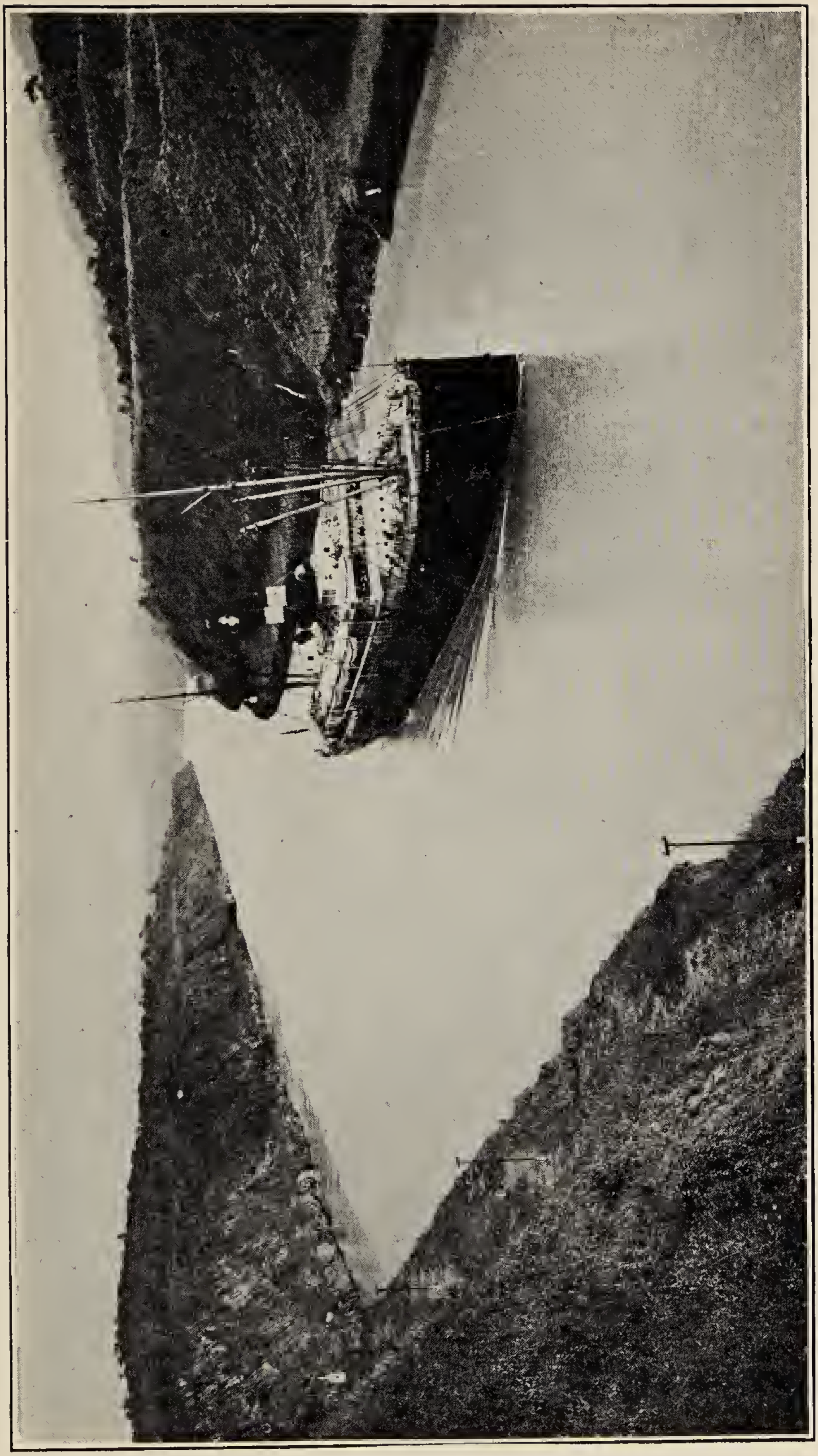

FIG. 165.—The steamship *Panama* passing through a portion of the Galliard cut in the Panama Canal. (*Panama Canal Official Photo.*)

the full interest on the money expended in construction. The canal may or may not actually pay for itself from the tolls collected; that matters little, for the direct and indirect benefits to the commerce and naval defense of the United States amply justify the cost. It is believed that the canal will be able to handle the increasing traffic for 15 or 20 years to come, but the United States government has already purchased from Nicaragua the right to construct a future canal through that country if it shall ever seem necessary to do so.

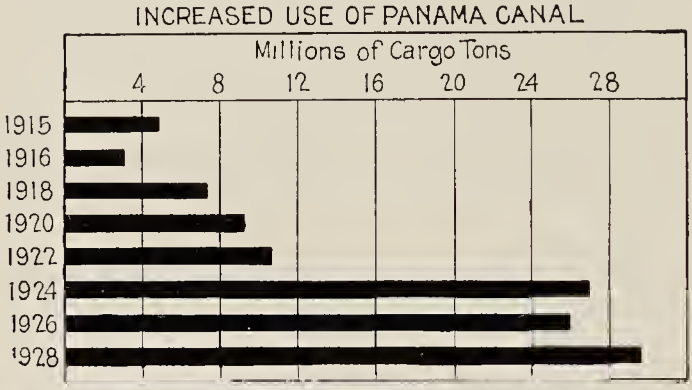

FIG. 166.

THE NORTH COAST OF SOUTH AMERICA

Political Divisions.—The Republic of Colombia, fifth in size among the countries of South America, is as large as France, Germany, and England combined, but has only 5 or 6 million people. Venezuela is smaller and has half as many people. The three Guianas—English, French, and Dutch—which do not actually border on the Caribbean, are unimportant tropical colonies containing very few white residents.

Dominant Geographical Features.—(1) All the countries have a sea frontage facing the United States and Europe; of the South American countries they are the most favorably situated for commerce. (2) All are within the tropics, and their lowlands are hot and ill suited to people of the white race. (3) All have extensive mountainous areas, and in the most accessible of these the white people live. (4) All have large areas that are wholly undeveloped and almost unexplored. (5) In all the countries some sort of agriculture is the chief occupation.

Natural Wealth.—During the 300 years of Spanish control, Colombia yielded upwards of 400 million dollars in gold, but has ceased to be the important gold producer of South America, though the output is still 1 or 2 million dollars a year. Venezuela also yields a small amount of gold. The only important platinum mines outside of Russia are in Colombia, and these have recently produced about half the world's supply. The production of petroleum in Venezuela has recently advanced greatly, and that country has taken second place as an oil producer. The chief oil fields are around Lake Maracaibo. Colombia is also yielding oil in increasing quantities. Colombia has the principal emerald mines of the world, but the annual production—a government monopoly—amounts to a relatively small sum. Coal exists and a few thousand tons are mined annually, chiefly for the use of the railroads.

All the countries have great areas of tropical forests, and some of these include rubber trees, but the production of rubber within their boundaries is small. The chief resources of the region are agricultural. and there are millions of acres of fertile soil wholly unused. When internal conditions improve, and the world's markets demand still greater quantities of sugar, cacao, and coffee, these lands can produce them. There are millions of acres of upland pasture suited to beef cattle, but only a minor part of them is used.

Economic and Political Conditions.—Both Colombia and Venezuela were the victims of long-continued misgovernment. Revolutions and disorders have been more or less frequent, though less frequent of late. Probably 85 per cent of the people belong to the colored races (Indian, negro, and some Asiatics) or are mixtures of these races with Europeans. Schools are few and poor and the great majority of the population is illiterate. Good roads are exceedingly rare and a large part of the transportation is on mule back over mountain trails. The Magdalena River is the chief artery of transportation in Colombia and the lower Orinoco is somewhat used in Venezuela. Railroads are few and poor. In 1928 Colombia had some 16 detached lines aggregating 1,500 miles in length, all poorly equipped, of varying gauges, and mostly unprofitable. For example, imported goods going from the Caribbean coast to the capital, Bogota, 700 miles inland and at an elevation of over 8,000 feet, must change conveyance seven times, paying freight and handling charges of $30 to $60 a ton and requiring from 2 to 5 weeks to make the journey. Passengers require from 10 days to 2 weeks by river steamer and various links of railroad to get from the coast to the capital.

Venezuela has 14 or 15 short railroads, some of them being less than 10 miles long. The longest line is about 100 miles in length and has 86 tunnels and 212 bridges.

Production and Commerce.—Coffee, the important commercial crop, makes up three-fourths of the value of the exports of Colombia. In Venezuela, it is the crop upon which the more industrious people mainly depend for their incomes. Much of it is carried many miles on mule back from the plantations, at an average cost per mile of 10 to 20 times as much as our railroads charge. There are large banana plantations on the north coast of Colombia, and cacao, grown in the low moist lands, is the second most valuable export crop of Venezuela. Sugar is raised, especially in the Guianas, but it is produced by rather primitive methods. Petroleum is now the leading export from Venezuela, yet the exports of either Colombia or Venezuela are scarcely one-third of those of Cuba. The foreign trade of these countries—increasing rather rapidly—is more largely with the United States than with any other country, in fact, more than with all other countries combined. So inadequate are the means of interior transportation, so small is the number of energetic people, so crude are the methods of agriculture, and so small is the available capital that production and commerce cannot be large until these conditions are much improved.

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CHAPTER XX

THE WEST COAST OF SOUTH AMERICA

The commercial contact of Colombia with the outside world is largely by way of its Caribbean ports; it is therefore treated with the Caribbean group of countries. Bolivia does not touch the sea, yet it essentially belongs to the west coast. Chile, in the temperate zone, is quite differently situated from the other countries, and so it is convenient to treat Ecuador, Peru, and Bolivia together, and Chile by itself.

ECUADOR, PERU, AND BOLIVIA

Backwardness of the Countries.—These countries have been under the control of Europeans and their descendants for 400 years, yet they have made slow progress. The three countries under consideration have a white population less than half that of California, a combined railroad mileage less than that of the small state of Indiana, and a foreign commerce less than that of the city of Seattle. The Pacific Coast of the United States has developed more in 60 years than the west coast of South America has in 400 years. What is the explanation?

Factors Involved.—The general economic condition of these countries is the product of three main factors; they are:

1. The geography, which includes (*a*) geographical location, (*b*) climate, and (*c*) topography.
2. The characteristics of the people.
3. The inheritance from the past.

Location.—Before the opening of the Panama Canal, the west coast of South America was a long sea journey from Europe and the eastern United States. From London to Callao, Peru, by way of the Cape Horn route is 10,000 miles, requiring about 50 days for a freight steamer. This long and expensive journey added a heavy freight cost to goods going to or from these countries and this has helped to retard their commercial growth. This difficulty has, of course, been lessened by the opening of the Panama Canal.

Lack of Harbors.—Owing to the position and character of the Andes Mountains, the entire coast from central Chile to Panama does not possess a single first-class harbor. At practically all of the ports, goods must be handled by lighters between the steamers and the wharves, adding delays and expense. With the exception of Guayaquil the harbors afford little protection and upon approach of a severe storm, ships often put out to sea for safety. The poor harbors have not, however, been a major factor in retarding the development of the countries.

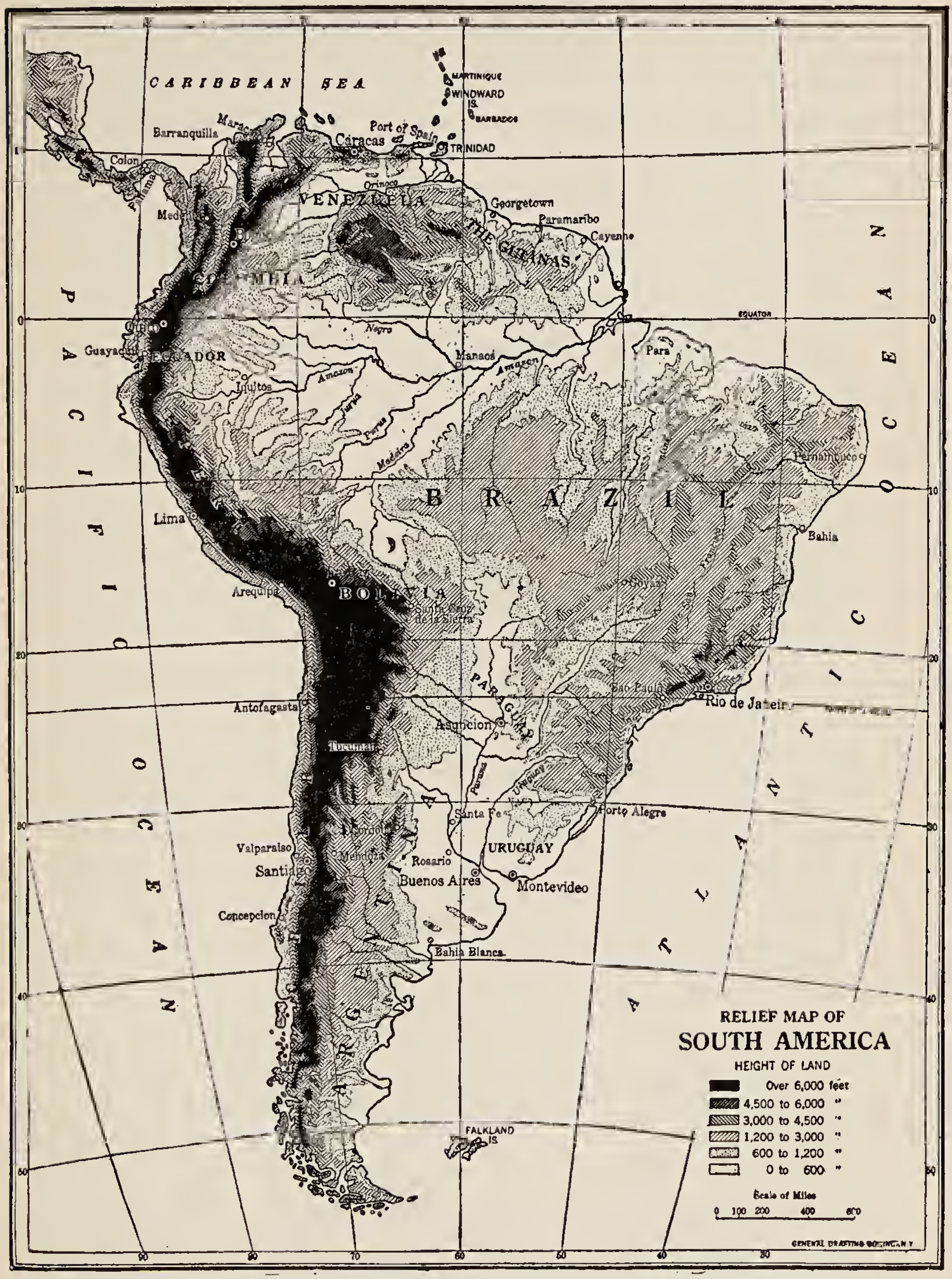
CARIBBEAN SEA
MARTINIQUE
WINDWARD IS.
BARBADOS
TRINIDAD
Port of Spain
Caracas
Barranquilla
Colon
Medellin
Orinoco
VENEZUELA
Georgetown
Paramaribo
Cayenne
THE GUIANAS
COLOMBIA
EQUATOR
ECUADOR
Guayaquil
Iquitos
Negro
Amazon
Manaos
Para
Madeira
Purus
Jurua
Pernambuco
BRAZIL
Lima
Bahia
Arequipa
BOLIVIA
Santa Cruz de la Sierra
Goyaz
PARAGUAY
Sao Paulo
Rio de Janeiro
Antofagasta
Asuncion
Tucuman
Parana
Uruguay
Santa Fe
Porto Alegre
Cordoba
URUGUAY
Valparaiso
Mendoza
Rosario
Santiago
Buenos Aires
Montevideo
Concepcion
Bahia Blanca
ARGENTINA
FALKLAND IS.
PACIFIC OCEAN
ATLANTIC OCEAN
RELIEF MAP OF
SOUTH AMERICA
HEIGHT OF LAND
Over 6,000 feet
4,500 to 6,000 "
3,000 to 4,500 "
1,200 to 3,000 "
600 to 1,200 "
0 to 600 "
Scale of Miles
0 100 200 400 600
GENERAL DRAFTING CO., INC., N.Y.
0
10
20
30
40
50
90
80
70
60
50
40
30

FIG. 167.—Highlands and lowlands of South America. The unbroken chain of the Andes extending along the entire western coast is a formidable barrier. The moderate highlands of Brazil are a decided benefit to the east coast. (*Map from Miller and Singewald's "Mineral Deposits of South America"*).

The Andes Barrier.—The Andes Mountains, the longest and one of the highest mountain systems in the world, make it very difficult to transport products from the coast to the interior or from the interior to the coast (Fig. 167). Only four mountain railroads connect the coast with the intermontane valleys and plateaus—four in a stretch of country 2,000 miles long. The Central Railroad of Peru, for example, climbs to 15,665 feet altitude in the first 106 miles from the coast; it has 16 switchbacks, 65 tunnels, and 61 bridges. The cost of building was so great that no profit is likely ever to be derived from its operation. La Paz, in Bolivia, is less than 500 miles inland, yet the freight charge on a ton of coal for this distance is several times as great as the normal ocean rate from England to the port terminal of the railroad, an ocean distance of some 10,000 miles.

The great altitude of even the lowest passes, the steepness of the slopes, the depth of the canyons, the dangers from land slides, and other difficulties, make the expense of railroad building and even of road building little short of prohibitive; yet transportation at reasonable cost is so essential to economic development that these west-coast countries could not in the past, and cannot now make satisfactory progress.

Climate.—The west coasts of Colombia and Ecuador have abundant rainfall and are heavily forested, but the coast of Peru is almost rainless and treeless. A cool ocean current moving northward along the coast of western South America causes at certain seasons a heavy fog, but rain rarely falls. The majority of the people of Ecuador and practically all those of Bolivia live at altitudes of 6,000 to 13,000 feet where the temperature is cool, and on the high Bolivian Plateau it is often disagreeably cold. At these high altitudes the few crops that are raised are those of the temperate zone. Fully half the area of Peru and Bolivia is east of the Andes, and is low, hot, fever-infested jungle sparsely inhabited by Indians. A country that drives its people into the mountains, with all of their disadvantages for economic life, in order that they may escape the tropical climate, cannot prove attractive to immigrants and can make only a slow growth in population and wealth.

The People and the Past.—When the conquering Spaniards came to the west coast of South America (about 1532) they found Peru and Bolivia inhabited by Indian tribes that had attained a considerable degree of civilization. These Indians—referred to as the Incas—built temples and palaces of cut stone, manufactured textiles and pottery, worked in copper, built paved roads, had an organized army, and an elaborate religion, and did many other equally notable things. These and other Indians were conquered and reduced to virtual slavery. The Spaniards cared chiefly for the gold and silver, and forced the Indians into the mines, where they rapidly perished from cruelty and overwork; the sacrifice of human life was appalling. For three hundred years the Spanish colonies were exploited and misruled, but early in the nineteenth century they revolted and obtained their independence. Then as now, the population consisted of a small minority of white people and a large majority of Indians and mestizos.

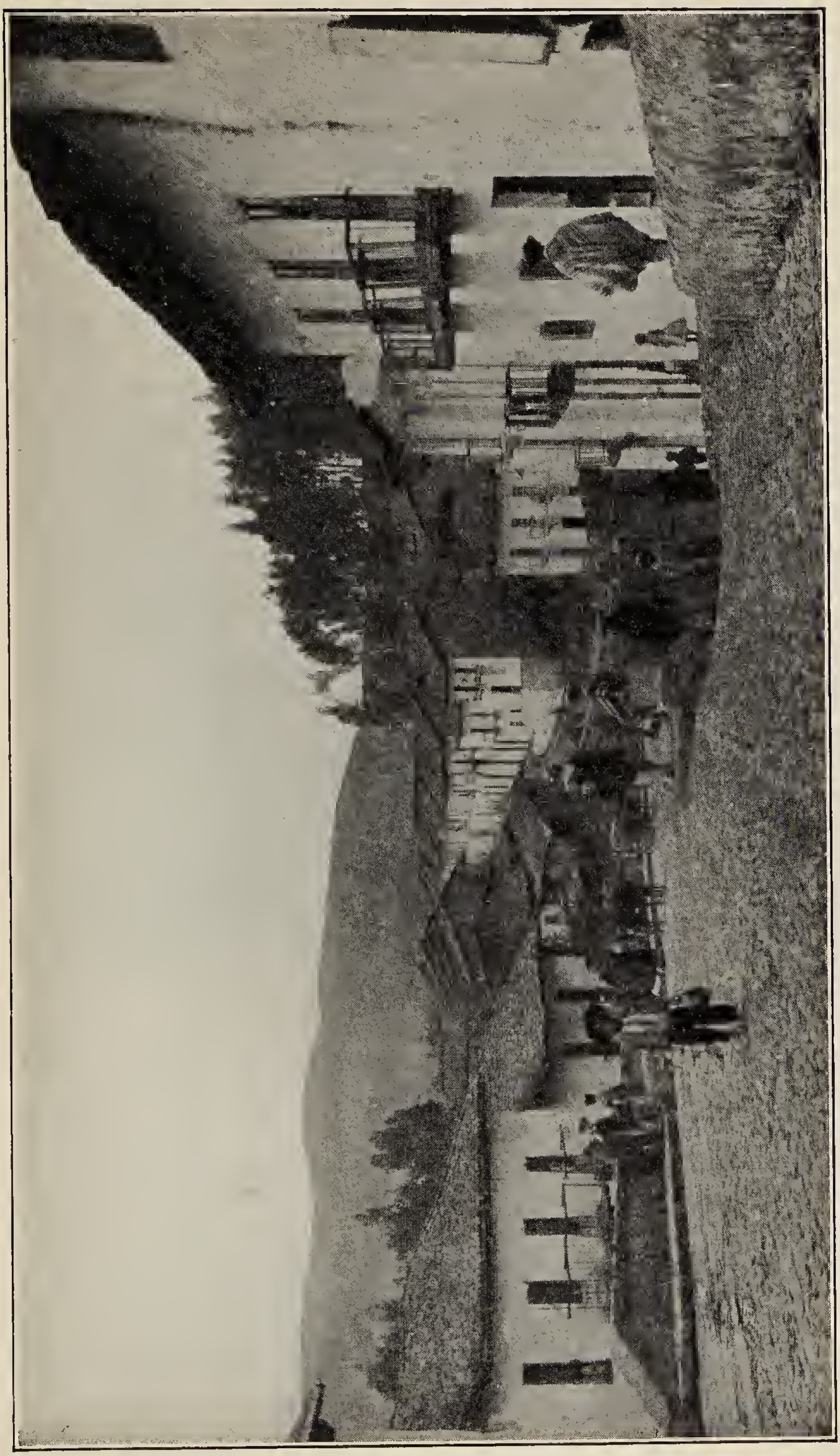

Fig. 168.—Street scene in Quito, Ecuador. Though Quito is nearly on the equator, its high altitude makes the climate cool enough to cause the natives to wear heavy woolen blankets. *(Copyright Keystone View Co.)*

Less than 10 per cent of the inhabitants of Ecuador, Peru, and Bolivia are of pure white ancestry. In the past revolutions have been more or less frequent; there is little immigration, little capital for developing the countries, and little efficient labor. The upper class includes people of wealth and refinement, but they are not fond of business and look down upon work. The pushing, money-making American unfavorably impresses the polished South American gentleman. But as time goes on the two are coming more and more in contact and a better understanding is growing up; the governments of these countries are improving, a little manufacturing is springing up, and commerce is increasing. One of the great handicaps of this region is the absence of an intelligent, industrious, property-holding middle class, unafraid of work, gifted with financial and mechanical ability, and devoted to education and good government.

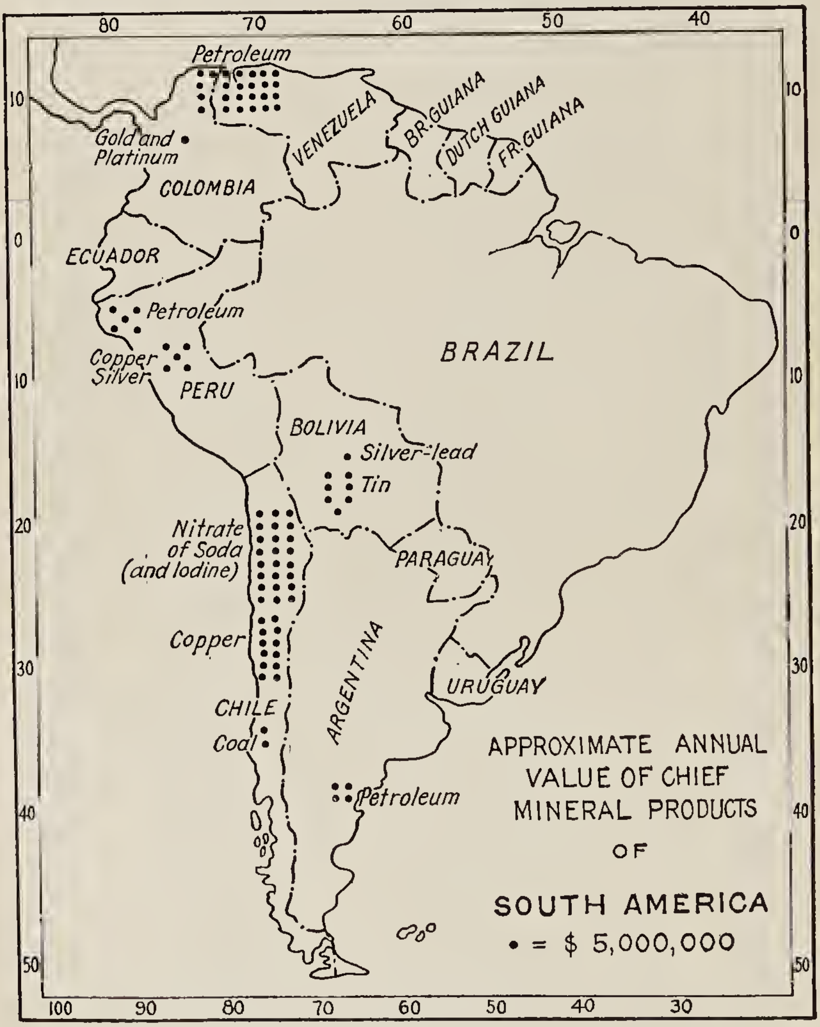
80
70
60
50
40
Petroleum
Gold and Platinum
COLOMBIA
VENEZUELA
BR. GUIANA
DUTCH GUIANA
FR. GUIANA
ECUADOR
Petroleum
Copper
Silver
PERU
BRAZIL
BOLIVIA
Silver-lead
Tin
Nitrate of Soda (and Iodine)
PARAGUAY
Copper
ARGENTINA
URUGUAY
CHILE
Coal
Petroleum
APPROXIMATE ANNUAL VALUE OF CHIEF MINERAL PRODUCTS OF
SOUTH AMERICA
• = $ 5,000,000
10
0
10
20
30
40
50
100
90
80
70
60
50
40
30

Fig. 169.—The values shown in this figure represent an average year, but they change greatly from good years to bad years.

The Natural Resources: Minerals.—(Fig. 169.) During the colonial period the Spaniards took billions of dollars' worth of gold and silver from their American colonies, but neither of these metals is now mined to any large extent anywhere in the Andes Mountains. Ecuador has no mines of importance of any kind. Peru and Bolivia are rich in minerals, but only copper—mainly from Peru—and tin from Bolivia are produced in a large way. The mines are far back in the mountains, hard to reach, and expensive to operate; most of the copper from Peru is mined by two American companies operating about 16,000 feet above sea level (Fig. 170). Fortunately coal is found near one of the mines and is employed in developing power for the mining operations and the railroad. Copper is the most important mineral exported from Peru, and it is shipped mainly from Callao, the chief port of the country. The great quantity of guano formerly found on islands along the coast is nearly exhausted and is no longer an export of importance; 400 million dollars' worth of this valuable fertilizer has been shipped from these islands. Near the northwest coast of Peru petroleum is produced in considerable quantity.

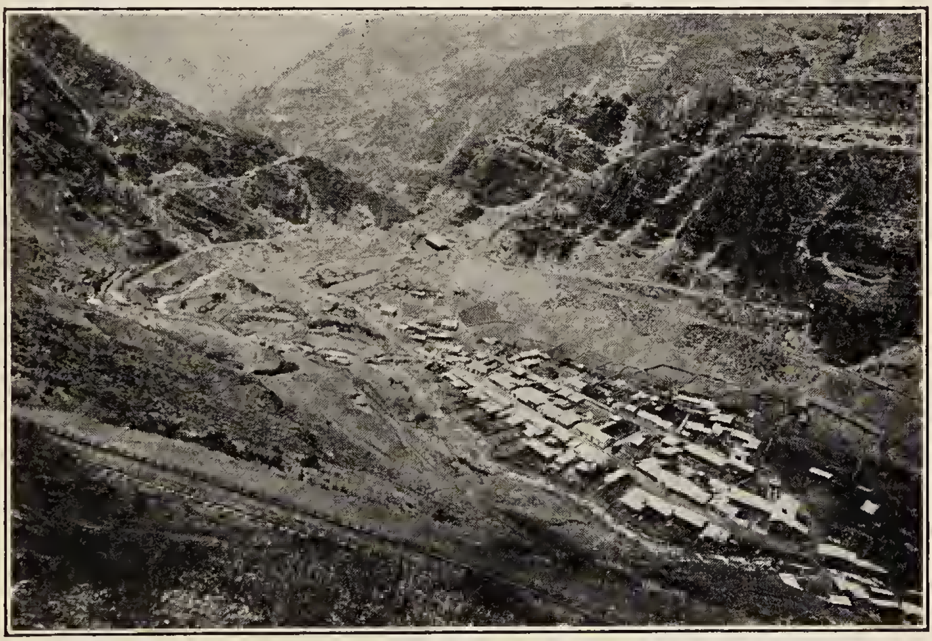

FIG. 170.—A mountain town on the Oroya Railroad (Peru), which crosses one range of the Andes at an altitude of about 16,000 feet.

Over 80 per cent of the mineral output of Bolivia is tin; silver, lead and copper together form 10 or 12 per cent. The larger part of the tin mines, but not all, are controlled by foreign capital. Bolivia ranks second in the world as a producer of tin, but its output is far below that of the Malay Peninsula and nearby islands (in southeast Asia) which produce about 60 per cent of the world's supply. Great as the mineral wealth of the Andean countries is, the actual production does not equal in value the sugar exported from the single island of Cuba. Yet there is no doubt that the production can be enormously increased.

Forest Resources.—The parts of Peru and Bolivia in the basin of the Amazon have dense forests in which are included wild rubber trees. This rubber—no longer so important as formerly—goes to the outer world through Brazil. Iquitos in Peru is one of the principal up-river rubber ports and, though 2,300 miles from the sea, it is reached by ocean steamers. The tagua palm of Ecuador and Colombia, whose seeds—as large as horse chestnuts—are very hard and ivory-like, supplies the ivory nuts of commerce from which "vegetable ivory" buttons and similar articles are cut. The cacao tree grows wild in Ecuador, but most of the cacao beans of commerce are gathered from cultivated trees.

Cacao Production.—Ecuador was one of the foremost producers of cacao beans from which cocoa and chocolate are made. These still form Ecuador's largest export. Eastern Brazil, several of the lands around the Caribbean, and the Gold Coast of Africa are also large producers, especially the Gold Coast. The seed pods are as large as cucumbers and have the odd habit of growing directly out from the trunk and largest limbs of the trees instead of from the twigs. The trees must be sheltered from winds, and the young trees must be shaded from the direct rays of the sun. The climate must be hot and the ground always damp.

The use of chocolate and cocoa has grown with remarkable rapidity and our own imports of the cacao beans have risen to tens of millions of dollars yearly. Ecuador had single plantations of 3 million trees, growing on the low wet lands which enclose the gulf of Guayaquil.

Panama Hats.—The most expensive straw hats in the world are made by the Indians of Ecuador from the fiber or '"straw" of a tropical shrub. The finest hats are woven only in early morning or late evening when the air is humid. An Indian often spends 5 or 6 months on a single hat which may sell in the United States for $20 or $25 and higher.

Agriculture.—Probably less than 5 per cent of Ecuador, Peru, and Bolivia is suited to agriculture as we think of that industry. The majority of the Indians and mestizos produce most of their own food (corn, potatoes, etc.) by crude agriculture, and it is crude indeed. In their rugged mountain environment they raise little more than they need for themselves, and neither Ecuador nor Bolivia exports any agricultural products worth enumerating. The following extract from a United States Commerce Report (October 4, 1919) thus describes agriculture in the main valley of Ecuador, 10,000 feet above sea level:

> "Agricultural methods are very primitive. About 99 per cent of the plowing in Eucador is nothing more than a shallow stirring of the surface of the soil by a sharpened board with an iron point drawn by a team of oxen and furnished with an iron handle, with which the farmer keeps the plow upright. There is no pretense of turning over the ground; it is simply slightly furrowed The agricultural lands of this region have never been turned over or even stirred to a depth of more than 4 or 5 inches. Nor have they ever been fertilized . . .

"Of course, the crops obtained by this cultivation are wholly inadequate. The corn consists of little nubbins 3 or 4 inches long. The soil, light and pliable, and the climate, mild and equable, are ideal for potatoes, and they constitute probably the principal crop of the region. But three-fourths of the potatoes displayed for sale in the local markets vary in size from a peanut to a tennis ball, while to produce even these the rows often have to be 5 or 6 feet apart . . .

"There is little market for imported farming machinery. All the farm work is done by Indians, who live under primitive conditions and know nothing about the modern methods of cultivation or the use of farming implements."

On the west coast of Peru are many large irrigated plantations, some of them owned by foreign investors; these produce practically all of the sugar grown in Peru. The chief crops are sugar, and cotton, and these two constitute the only important agricultural exports of the country (Fig. 172). These irrigated plantations are in the alluvial valleys of the small rivers flowing down from the Andes, and are served by short railroads reaching to the ports. If enough irrigation water could be secured, the acreage of cotton and sugar might be greatly increased. An acre of Peruvian cane under irrigation yields from 8,000 to 10,000 pounds of sugar, a very high average. At this rate, an area the size of an ordinary county in the United States, say 4 townships square (or 368,640 acres), would produce 3½ billion pounds a year or about 10 per cent of the

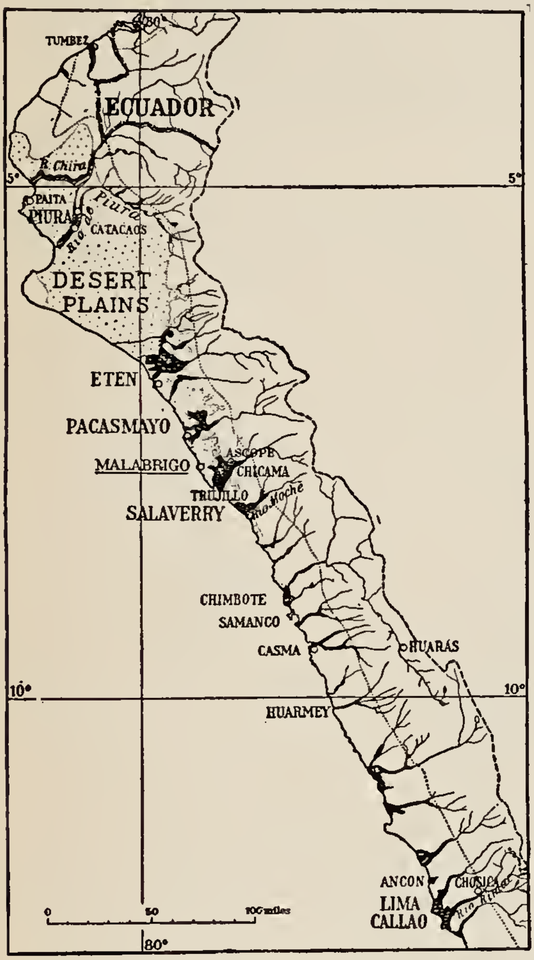
TUMBEZ
80°
ECUADOR
R. Chira
5°
5°
PAITA
PIURA
Piura
Rio
CATACAOS
DESERT PLAINS
ETEN
PACASMAYO
MALABRIGO
ASCOPE
CHICAMA
TRUJILLO
Rio Moche
SALAVERRY
CHIMBOTE
SAMANCO
CASMA
HUARAS
10°
10°
HUARMEY
ANCON
CHOSICA
LIMA
CALLAO
Rio Rimac
0
50
100 miles
80°

Fig. 171.—Irrigated lands in river valleys along the coast of Peru. These are the chief agricultural areas of Peru. (*From the Geographical Review, published by the American Geographical Society of New York, vol. 4, p. 219.*)

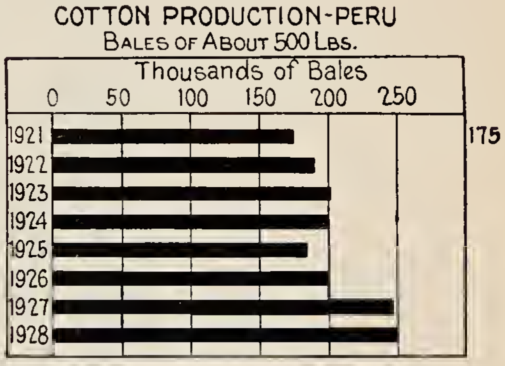

Fig. 172.

world's supply, a suggestion of the enormous productive power of the tropics when the land is utilized to its full possibilities.

Animal Products.—Large areas among the mountains are suited to grazing, and wool is obtained from sheep and from the alpaca and the llama, the principal beast of burden of the Andes. Considerable numbers of cattle but few swine are raised. The rural inhabitants—mainly Indians—use much of the native wool in making the blankets, which are so characteristic of the dress of these people; wool is also one of the exports.

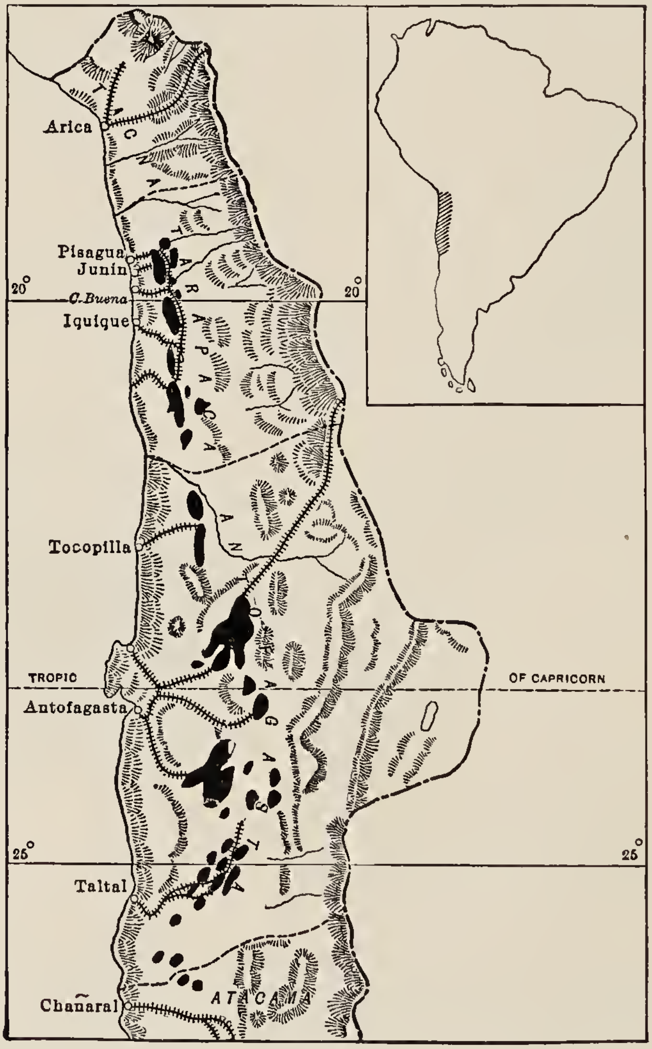
Arica
TACNA
Pisagua
Junin
20°
C.Buena
20°
Iquique
TARAPACA
Tocopilla
ANTOFAGASTA
TROPIC
OF CAPRICORN
Antofagasta
25°
25°
Taltal
Chañaral
ATACAMA

Fig. 173.—The northern end of Chile. Black areas represent principal nitrate-producing areas. (*After Tower, in Miller and Singewald's "Mineral Deposits of South America"*).

CHILE

The Country and the People.—As a nation Chile ranks third in importance among South American countries. It has the great advantage of being in the temperate zone, a fact of more moment than the mere statement might indicate. The mountains near the coast are lower than they are in Peru and the greater part of the country is readily entered from the sea. Chile is long and narrow; but, unlike the countries farther north, it is all on one side of the eastern chain of the Andes. So long is the country that if one end were placed at Key West, Fla., the other end would reach to the middle of Hudson Bay in northern Canada. The population—nearly 4 million— is largely white, but includes also a mixture of Spanish with the warlike Araucanian Indians, and a small proportion of pure-blood Indians. Chile is regarded as having the best trained army and navy in South America. It is believed that the militaristic tendencies of the people are partly traceable to the Araucanian blood in the Chilean people. In the past the government has been controlled by a small upper class who hold the land in large estates, but that control has recently been weakened by the rise of a labor party. The lower class is uneducated and takes practically no part in the government, which, it may be said, is one of the most stable in South America.

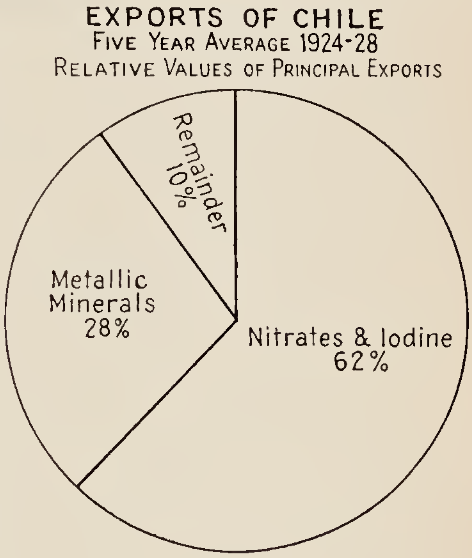

Fig. 174.

The Nitrate Fields.—The northern quarter of Chile is one of the most absolute deserts in the world (Fig. 173). Rain does not fall for years at a time, and this excessive aridity has permitted the preservation of the extensive beds of nitrate of soda lying almost at the surface of the ground. This valuable salt would long since have been carried away in solution if rain fell here. As found in the ground the nitrate is mixed with earthy material, but is easily mined; it is taken to the refining plants nearby where the salt is dissolved and separated from the sand and clay; then by evaporating the solution, the nitrate crystallizes out and is shipped in sacks to Europe and the United States (Fig. 174).

These nitrate deposits are the greatest source of wealth to Chile, and the most important mineral deposits in all South America. The *oficinas*—as the nitrate works are called—employ many thousands of workmen and the exports usually exceed 2 million tons a year, upon which the government in the past has collected an export tax of about $12.00 a ton. It is estimated that the deposits still contain enough nitrate for hundreds of years. The Chilean nitrate exceeds in value all the other minerals mined in the west coast countries. In time of peace it is chiefly used for fertilizer; in war time it is an important constituent of explosives, This nitrate is now meeting severe competition from manufactured substitutes and the industry in Chile is endangered. An improved method of extracting the nitrate has been perfected by an American mining company and this may save the industry.

Coal.—The only country of South America that mines coal on a commercial scale is Chile whose mines are in the south central part of the country by the sea. The output is small and the quality is only fair; yet these mines are a distinct advantage to Chile, for imported coal is expensive.

Iron.—There are also important bodies of high-grade iron ore in middle Chile close to the sea. The best of these are owned by an American company and the ore is being shipped by way of the Panama Canal to the eastern United States. The coal of Chile cannot be made into coke for smelting the iron ore; consequently, an iron and steel industry in Chile has thus far been out of the question.

Copper.—Next to nitrate, copper is the leading mineral product of Chile, and of the west coast as a whole (Fig. 169). The largest properties are controlled by two of the powerful copper companies of the United States. One of these properties represents an investment in Chile of over 100 million dollars. The largest mines are in the desert section of the north where operations are carried on under severe handicaps, yet copper is produced here at an unusually low cost.

Agriculture.—It has often been noted that Chile very closely reproduces the climatic and topographic conditions of the west coast of the United States and Canada, reversed with respect to position. Northern Chile with its arid mountains corresponds to Lower California and southern California. Central Chile and its rich agricultural valley, partly irrigated is strikingly like the Great Valley of California in climate, topography, and products—even including irrigation and vineyards. Southern Chile with its drowned coast, heavy forests, fiords, glaciers, lakes, and off-shore islands is remarkably like British Columbia and southern Alaska.

The "Vale of Chile," as the central valley is called, is upwards of 400 miles long and about 25 miles wide. Most of the farm land, 75 per cent of the population, most of the important cities, and two-thirds of the railroad mileage of the republic are in this valley. The amount of land in all Chile suited to farming is placed at 36 million acres, equal to the area of Wisconsin, but less than 4 per cent of the total area is cultivated. All the crops of the temperate zone are produced, but farming methods are somewhat crude. Wheat is grown on over half of the plowed land and vineyards occupy 8 per cent of the cultivated land.

Manufacturing, Transportation, and Commerce.—Chile has made more progress in manufacturing than any other west coast country, yet the industry is only in its infancy. With coal, iron, and water power, a temperate climate, a stable government, and a vigorous people, Chile ought in time to develop into an industrial nation. It has one of the best railroad systems in South America, including a part of the trans-Andine road, the 800-mile line that extends from the Atlantic at Buenos Aires across the Andes at an elevation of over 10,000 feet to the Pacific at Valparaiso (Fig. 178). Up to date this road has been something of a disappointment financially, not having paid expenses. The freight traffic is light and the earnings are chiefly derived from passengers. The foreign trade of Chile (upwards of $80 per capita of the population) is the third largest in South America. Since the World War and the opening of the Panama Canal, Chile carries on more trade with the United States than with any other country.

Effect of the Panama Canal.—Prior to the opening of the Canal, one of the greatest handicaps to the development of the west coast was its distance by water from Europe and the eastern coast of the United States. Freight rates across the Isthmus by the Panama Railroad were exorbitant and prevented any large use of that route. (With the opening of the Canal in 1914 the west coast countries were immediately brought thousands of miles nearer to the great commercial nations.) During the war and for several years afterward, the commerce of the world was disordered, and the effect produced by the opening of the Canal could not readily be determined. However, a notable increase in the commerce between the United States and Pacific South America occurred and since the war the United States has continued to hold a larger place in this trade than any other country. Already the second largest stream of traffic moving through the Canal from the Atlantic to the Pacific is that going to the west coast of South America. The increasingly close commercial relations between the United States and the west coast are sure to increase American investments in this part of the world and to build up an even larger trade, although that trade can never be as large as that with the east coast of South America.

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CHAPTER XXI

ARGENTINA AND URUGUAY

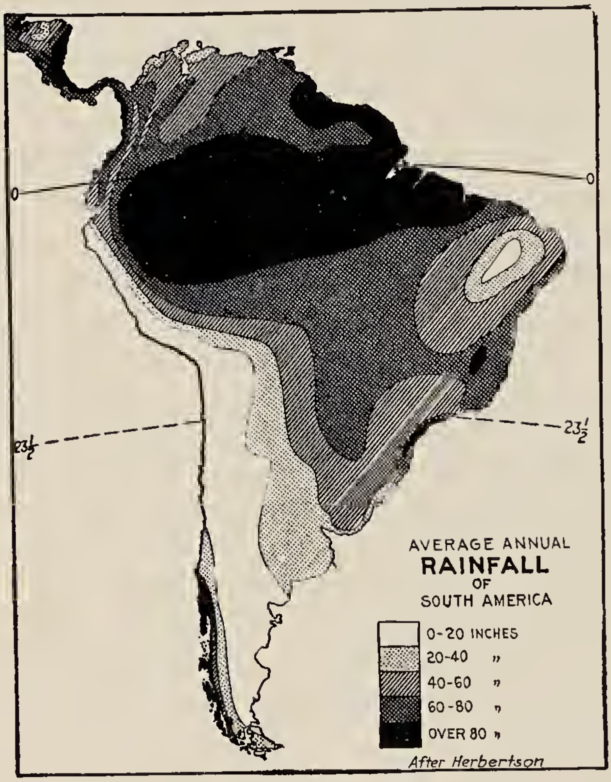
ARGENTINA

Rapid Progress.—Argentina is the most rapidly progressing country of Latin America. The population (10,000,000) is smaller than that of Mexico or Brazil, but it is composed almost entirely of white people. Buenos Aires, the capital, with about one-fifth of the entire population of the country, is the largest city in the southern hemisphere and second only to Paris among the Latin cities of the world. It is a city of great wealth and extravagance, of ornate architecture, and of great commercial activity. The government is stable and progressive, and its credit abroad is good. Argentina has not the variety of resources or the future possibilities of Brazil, but at present it holds the position of the leading commercial nation of South America.

Basis of the Rapid Progress.—It frequently has been pointed out that in judging the causes that have made a nation great, two factors are jointly responsible: one is the *geography* of the country, and the other is the character of the *people* who occupy it—the geographical factor, and the human factor. In both these Argentina has been fortunate. (1) The country is of large size and a good proportion of it is productive. (2) The greater part of it is level or moderately rolling land and much is very fertile (Fig. 176). (3) It is one of the few parts of the temperate zones where extensive cereal-growing lands reach down to the sea; most of the great temperate plains are in the interior of continents. (4) It has a mild temperate climate. All of these conditions are favorable to great agricultural and pastoral development, which is the basis of the rapid progress of the country.

Two Retarding Factors.—Unfortunately Argentina has little mineral wealth—no coal or iron worth mentioning, only a little petroleum, and a few minor minerals. Unless future explorations bring to light new mineral wealth, Argentina must remain chiefly a pastoral and agricultural country. Even for this all is not propitious, for the southern and western parts receive very little rainfall, and clouds of destructive locusts invade the country from time to time and destroy nearly every green thing in their path.

The Four Sections of the Country.—Argentina is 2,700 miles in length and 800 miles in width in the widest part. (1) The Chaco, lying in the northeast constitutes about one-fifth of the country. It is tropical or subtropical in climate, and is largely covered with forests which supply the most important commercial product of the region—*quebracho* wood. (2) The Pampa includes about one-fifth of the country. It lies in the east, receives from 20 to 35 inches of rainfall, is remarkably level, and constitutes the very heart of the nation. (3) Nearly one-third of the area (Patagonia) lies south of the Colorado River and is a dry, thinly-peopled land with scarcely an important town. The prevailing westerlies coming from the Pacific lose their moisture as they rise on the Chilean side of the Andes, and descend on the eastern side as dry winds, giving Patagonia scarcely enough rain to maintain its far-stretching sheep pastures. (4) The remaining one-fourth of the country includes the arid eastern slopes of the Andes and their foothills—a strip averaging 100 miles wide lying west of the Chaco and Pampa.



After Herbertson

Fig. 175.

The Importance of Rainfall.—The limiting factor in the agricultural development of Argentina is rainfall (Fig. 175). The country depends and must continue to depend upon crops and livestock for its prosperity, and both of these depend upon rainfall. Figure 175 shows that only the Pampa and the Chaco receive more than 20 inches of rain yearly, about the minimum that will permit of agriculture without irrigation. The climate of the Chaco is too warm and humid for cereals, so the Pampa is the only temperate area receiving sufficient rainfall for general agriculture, and even parts of the Pampa have droughts once in

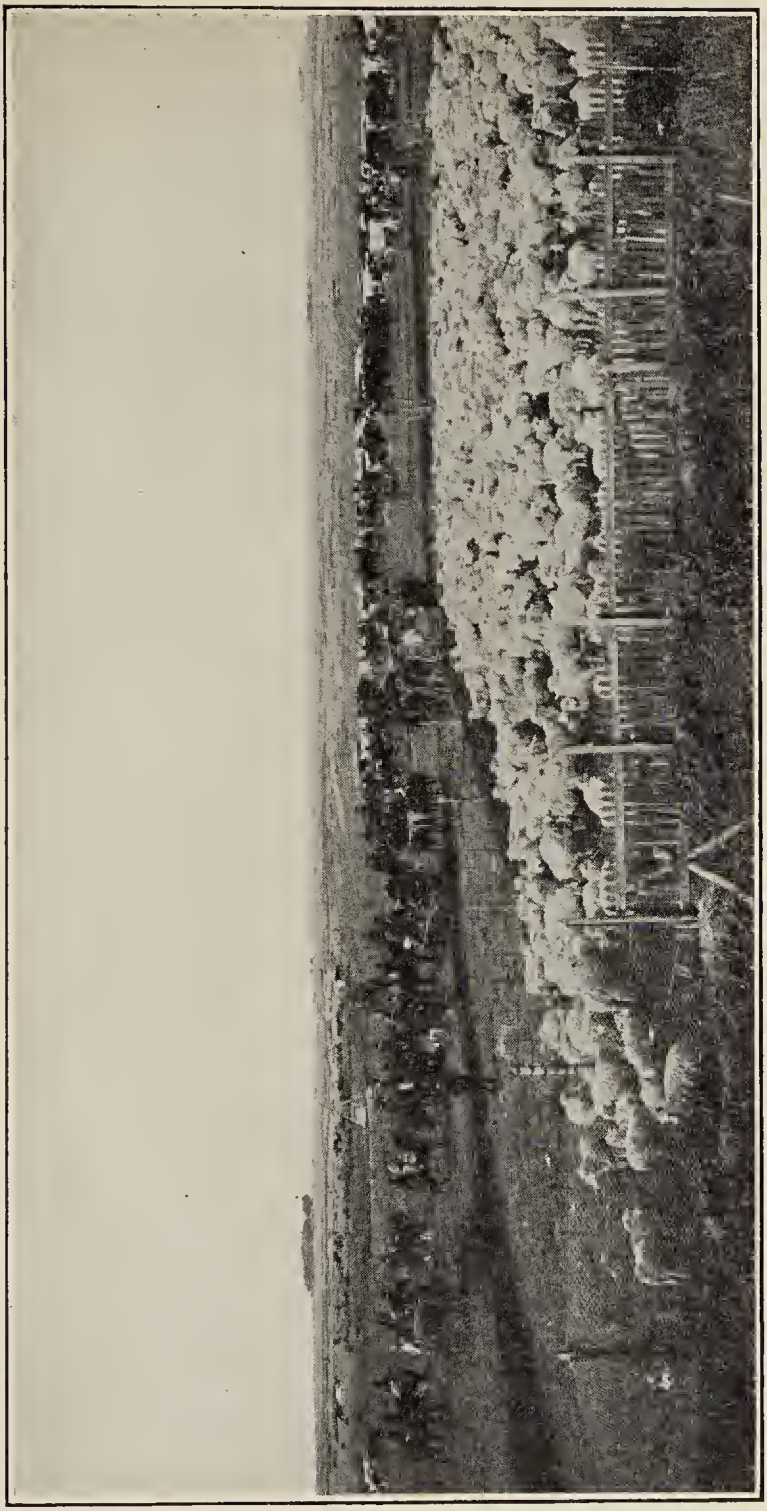


FIG. 176.—The level grass lands of the Argentine pampa have produced horses, cattle and sheep with comparatively little human labor for three centuries. (*Pan American Union*).

every six or seven years. Yet the land is so fertile, so level, and so favorably located for exporting its products that it is one of the great food-exporting regions of the earth.

Railroad Building, Cause and Consequence.—Nothing that man can do for the development of a country is more effective than the building of railroads. The Andean countries suffer and must always suffer because of the difficulty of building lines of transportation in them. Brazil finds railroad construction no easy matter, but the Pampa of Argentina is so level that railroad building has been easy. Already 24,000 miles have been laid down, radiating from the capital and chief port, Buenos Aires, and forming a network over the Pampa (Fig. 178). Most of the roads were built and are still owned by English capital, and as a rule are financially prosperous. Unfortunately the railroads are of several different gauges, thus preventing the free interchange of cars among the different lines.

Millions of Sheep.—In the early days the population was sparse and the easiest way to use the land was to allow the flocks of sheep and herds of cattle to multiply and feed upon the grassy plains. Sheep raising reached its height about 1900 when there were nearly 100 million sheep. At present the number is much less, though the value of wool produced is greater than it was in 1900 (Fig. 179). This is due in part to the improvement of the sheep by cross-breeding with heavy-fleeced sheep from

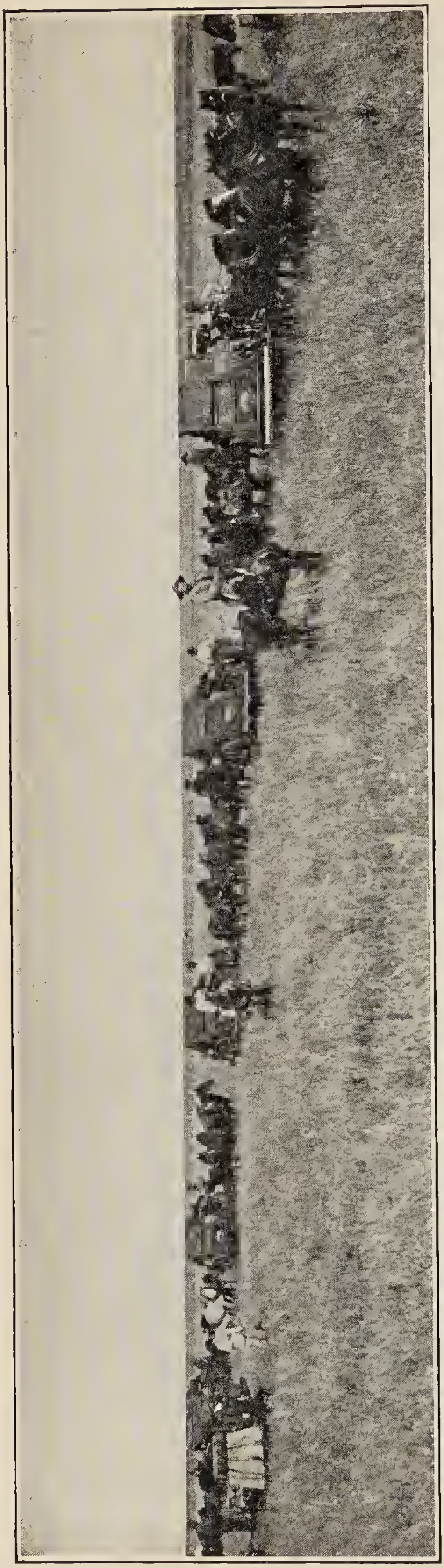


Fig. 177.—Wheat harvest on the Argentine pampa. The wheat has been cut, threshed, and bagged in the field by these machines. (*U. S. Dept. Agr.*)

England, and in part to the advance in the price of wool. By crossbreeding the Argentine sheep with selected English breeds, the average weight of a fleece has been doubled; and by the introduction of the meat-freezing and meat-chilling processes and refrigerator ships the raising of sheep for mutton as well as for wool has developed. The Pampa is still the region of greatest sheep raising, but millions graze on the cooler semi-arid lands of Patagonia where they constitute almost the sole source of wealth. Wool and mutton are two of the leading exports of Argentina; wool alone sent to the United States has brought over 100 million dollars in a single year. The sheep are sheared annually and almost wholly by shearing machines. An example of the relative cheap-

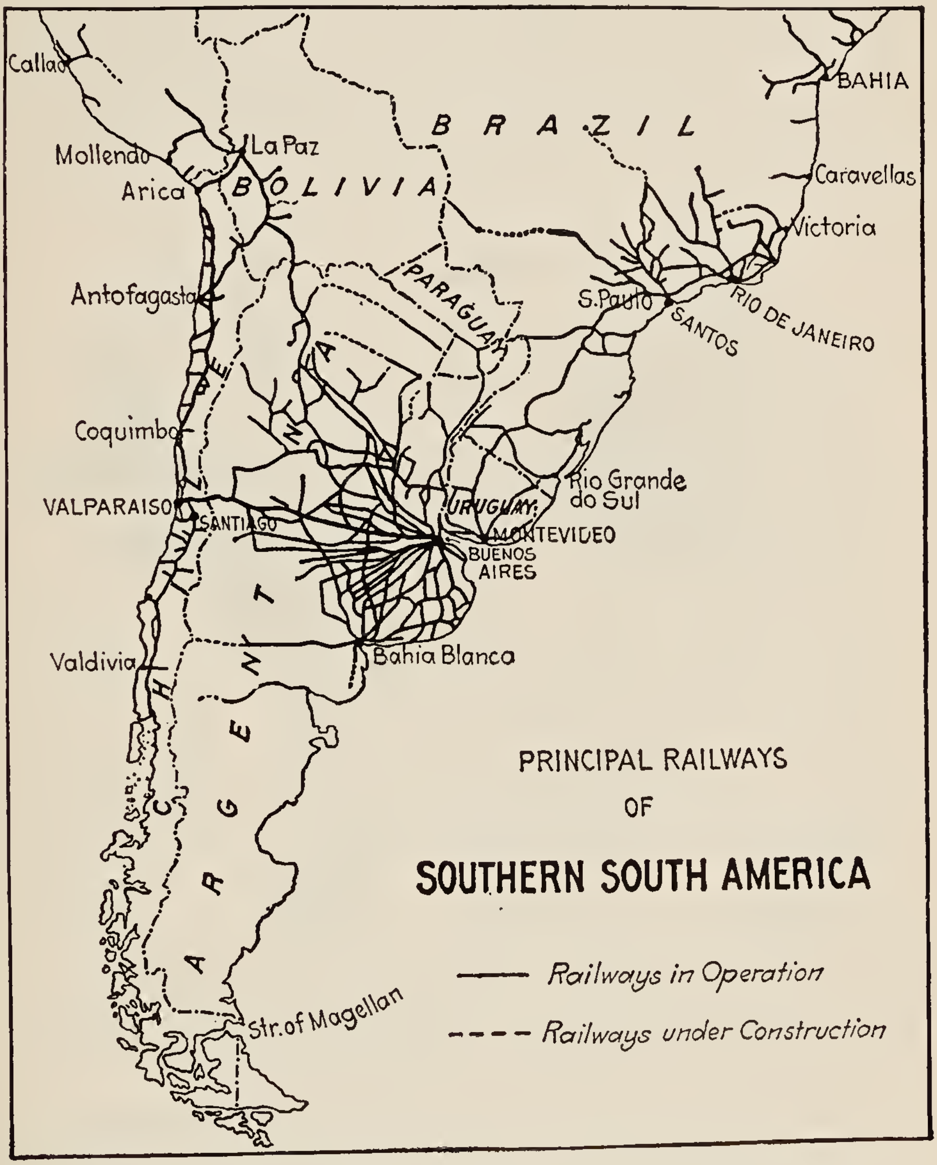
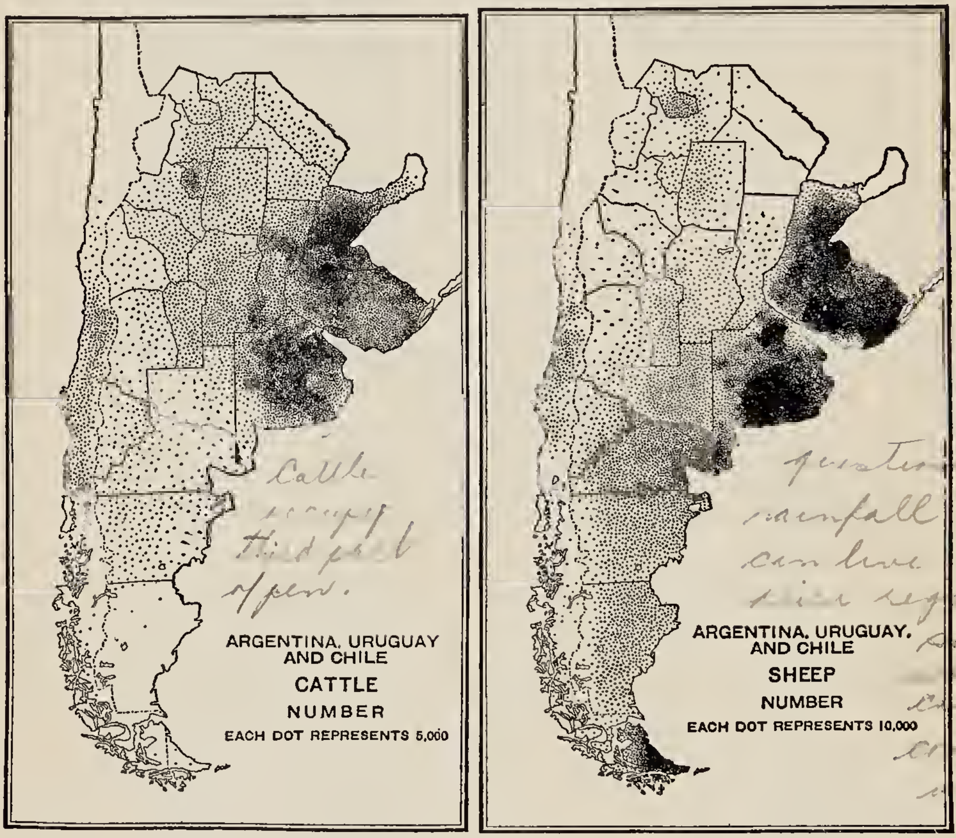

Callao
Mollendo
Arica
La Paz
BOLIVIA
BRAZIL
BAHIA
Caravellas
Victoria
Antofagasta
PARAGUAY
S.Paulo
SANTOS
RIO DE JANEIRO
CHILE
Coquimbo
ARGENTINA
Rio Grande do Sul
VALPARAISO
SANTIAGO
URUGUAY
MONTEVIDEO
BUENOS AIRES
Bahia Blanca
Valdivia
Str. of Magellan
PRINCIPAL RAILWAYS
OF
SOUTHERN SOUTH AMERICA
—— Railways in Operation
---- Railways under Construction

Fig. 178.—The railway mileage of all South America is about one-fifth that of the United States.

ness of ocean transport is seen in the fact that the cost of hauling a ton of wool one league (about 3¼ miles) over the poor roads of the Pampa costs about the same as the ocean trip of 8,000 miles from Buenos Aires to Boston. Argentina is one of the three leading sheep-raising countries of the world (Australia, United States, Argentina).

The Cattle Industry.—Argentina has three times as many cattle as people, and the cattle are of high quality, due to years of cross-breeding with the best imported stock (Fig. 179). Cattle require better pasturage than sheep and are raised mainly in the eastern provinces where the rainfall is most abundant, but the introduction of alfalfa has greatly extended the area of successful cattle raising. For 200 years, before modern refrigerating methods came into use, the lean, bony, long-horned cattle roamed over the Pampa under the charge of the picturesque *Gaucho* or half-breed cowboy. The cattle were killed for their hides, bones, and tallow; a little of the meat was dried in the sun and sold as *jerked beef,* but most of the meat went to waste as there was no market for it. For many years the production of this jerked beef was a characteristic industry in Argentina and Uruguay. Now, with modern slaughter houses, refrigerator cars and refrigerator ships, and the great improvement in


ARGENTINA, URUGUAY AND CHILE
CATTLE
NUMBER
EACH DOT REPRESENTS 5,000
ARGENTINA, URUGUAY, AND CHILE
SHEEP
NUMBER
EACH DOT REPRESENTS 10,000

Cattle occupy the best part of plain.

question of rainfall - sheep can live in drier region of south chiefly cattle a concentr in nort

Fig. 179.—The best of the humid lands of the River Plate region is controlled by the stockmen. (*U. S. Dept. Agr.*)

the quality of the cattle, fresh meat has become one of the chief exports of the region. Hides and tallow still yield tens of millions of dollars yearly. In a single year the United States has imported from Argentina hides to the value of 40 million dollars, and tallow to the value of 10 million dollars. Most of the fresh meat goes to Great Britain, but a little comes to the United States. As a rule, the total annual value of animal products of all kinds in Argentina is less than the total value of agricultural products, but this is not true every year. More recently dairying has become important and now cheese and butter factories are numerous. Butter of good quality is exported—mainly to Great Britain.

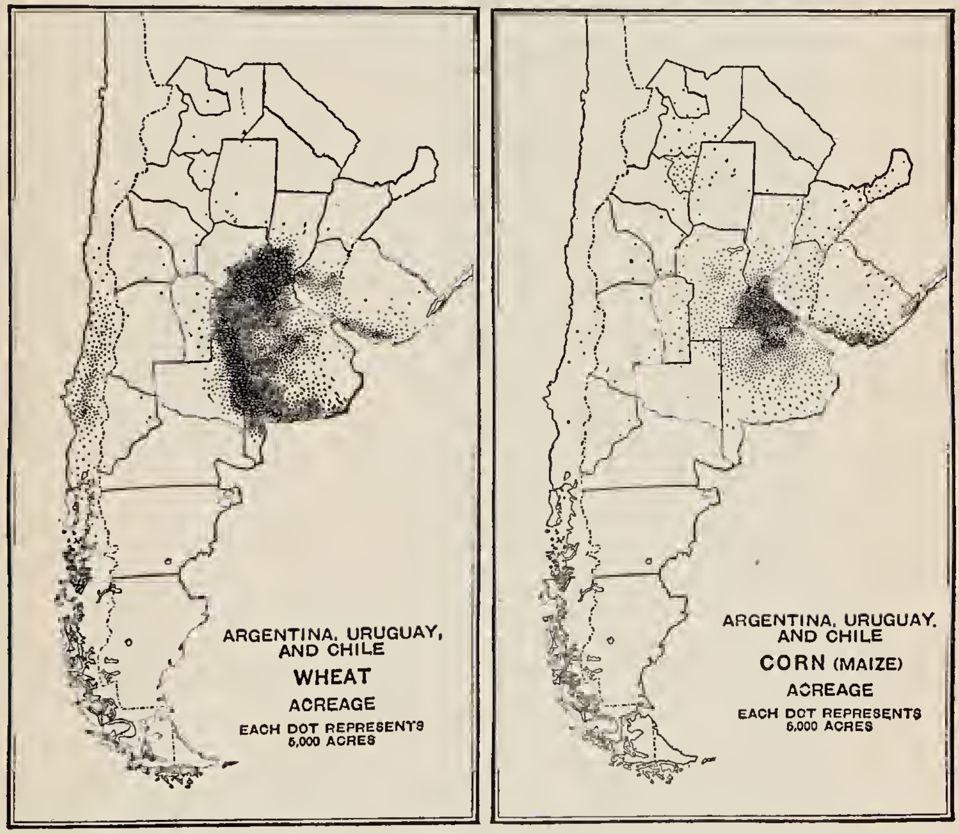

ARGENTINA, URUGUAY, AND CHILE
WHEAT
ACREAGE
EACH DOT REPRESENTS 5,000 ACRES
ARGENTINA, URUGUAY, AND CHILE
CORN (MAIZE)
ACREAGE
EACH DOT REPRESENTS 5,000 ACRES

FIG. 180.—The Argentine wheat belt lies on the semi-arid margin of the corn and livestock regions. (*U. S. Dept. Agr.*)

Alfalfa.—It has already been pointed out that alfalfa has the power of sending its roots many feet through the soil down to the ground water. It is the ideal forage plant for dry lands, and its introduction into Argentina has worked wonders in the cattle industry. Five or six crops a year may be cut; it fattens cattle and even hogs almost as well as corn. On some of the warm, dry lands, where the natural grasses would support but few cattle, the deep-rooting alfalfa grows luxuriantly and provides fodder for ten times as many cattle as formerly grazed there. Where 8 to 10 acres of ordinary pasture were required to support one steer, an acre of alfalfa will now do it. Cattle are brought into fit condition for market about a year sooner by feeding alfalfa than by ordinary grazing, and already 18 to 20 million acres are producing this crop.

A Great Cereal-producing Country.—Nature made Argentina one of the granaries of the world; and it is today the greatest surplus food producer among the nations; that is, no other nation produces so much food in proportion to its own consumption (Fig. 180). Wheat is the leading cereal, but corn, oats, barley, rye, and linseed are also grown in large quantities. Much of the land is held in great estates, often including tens of thousands or even hundreds of thousands of acres. The majority of the farmers are tenants who take none too deep an interest in the land, and move about a great deal; hence the production per acre is often low. Farm labor is scarce but modern farm machinery is used. The cereal-growing belt is within a radius of about 400 miles of Buenos Aires where rainfall is fairly ample and the land is almost perfectly flat (Fig. 176). The area under cultivation is equal to two or three of our best agricultural states, and the total production of grain is about one-eighth as large as in the United States, yet the amount exported is in normal times

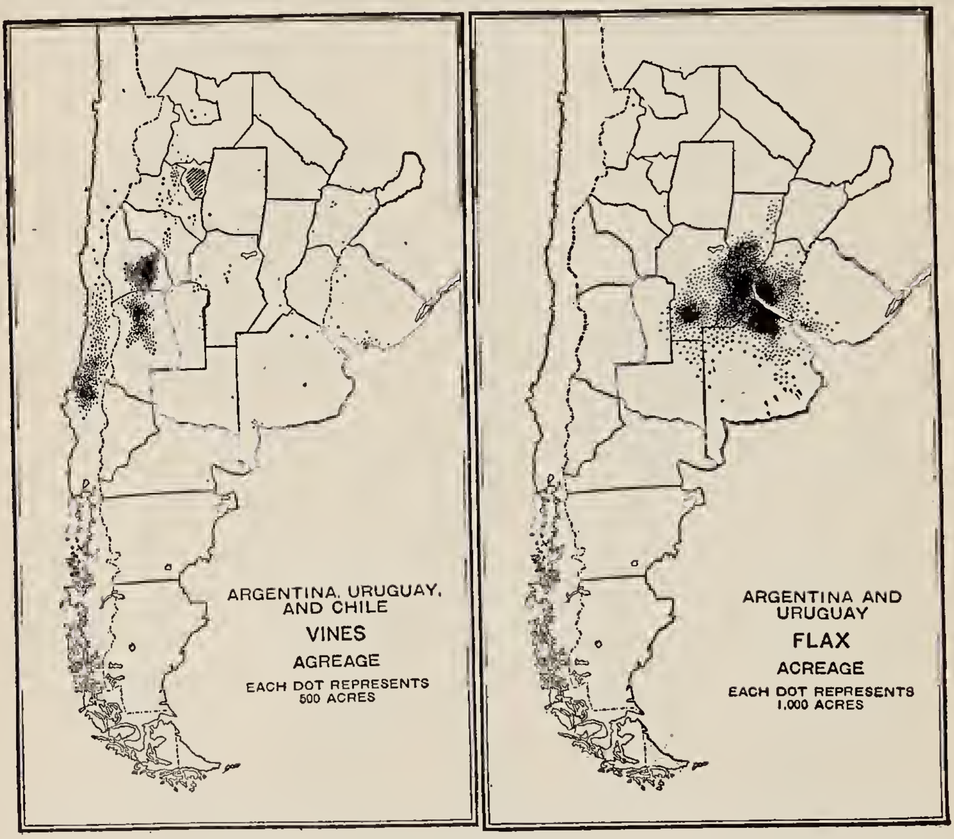

ARGENTINA, URUGUAY, AND CHILE
VINES
ACREAGE
EACH DOT REPRESENTS 500 ACRES
ARGENTINA AND URUGUAY
FLAX
ACREAGE
EACH DOT REPRESENTS 1,000 ACRES

FIG. 181.—Grapes for wine, raisins and table use are grown under irrigation in Chile and western Argentina. The ruled district in Tucumán, Argentina, marks the principal sugar cane district. Flax for seed is an important crop in the cereal region. (*U. S. Dept. Agr.*)

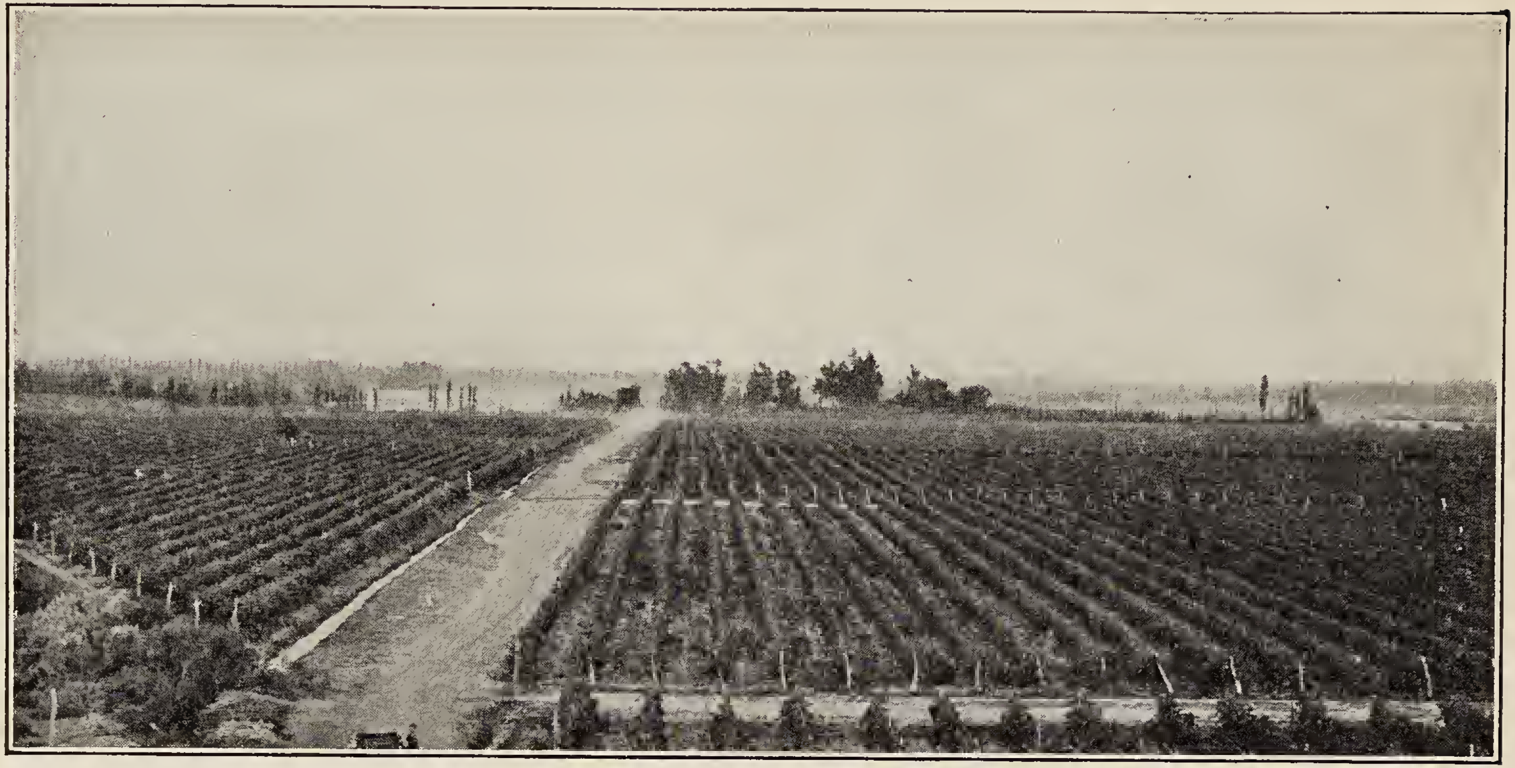


Fig. 182.—An irrigated vineyard in Mendoza, Argentina. The development of fruit and wine production in this region is restricted by a limited market. (*Pan American Union*).

greater. Argentina is the leading exporter of corn, for this grain is not there extensively fed to swine. Argentina is also a large exporter of linseed (flaxseed) (Fig. 181). The United States exports 3 or 4 per cent of its corn and 7 per cent of its oats; Argentina exports 75 and 80 per cent respectively.

On the whole, however, rural life in unattractive; farm houses are commonly made of sods or mud and the farm tenants are usually poor. Social and educational advantages are few and little is done by the land owner to improve conditions. A man without money has little chance to get desirable land, and the independent, land-owning farmer found in the United States is little known in Argentina.

The Irrigated Crops—Sugar and Grapes.—In the foothills of the Andes, the rainfall is light and crops can be grown only under irrigation. In two places the government has undertaken large irrigation projects. In the northerly province of Tucumán the climate is subtropical and most of the 200,000 acres of irrigated land there is devoted to sugar cane, and the sugar produced by its 30 sugar mills is usually sufficient for the nation's needs.

Farther south, around the city of Mendoza on the Transandine Railroad, is the wine-growing section of Argentina, where 80 per cent of the wine produced in the country is made (Figs. 181, 182). Some of the wine making establishments are strictly modern and of great size. It is said that the wine casks are made of staves shipped in the rough from the United States to France, there shaped and fitted, and sent thousands of miles to Argentina where the casks are set up.

FACILITIES FOR TRANSPORTATION

Rivers.—The Rio de la Plata, or River Plate, as the English term it, is not a river at all, but merely a broad shallow estuary which receives two large rivers—the Uruguay and the Paraná. The latter is one of the three great rivers of South America and has a volume much greater than that of the Mississippi. The Paraná and its large tributaries, the Paraguay and the Uruguay, are navigated by river steamers for more than a thousand miles above Buenos Aires, and these waterways are the main outlets for parts of Uruguay, Paraguay, southern Brazil, and northern Argentina. Ocean vessels drawing 26 feet ascend the Paraná to Rosario, one of the great shipping ports of Argentina. The Uruguay and Paraná are used for shipping pine lumber from southern Brazil to Argentina and Uruguay, while the Paraguay and Paraná carry quebracho and yerba maté down stream to Buenos Aires. The Plata estuary and the Paraná are of utmost value to the external trade of Argentina but the other rivers are of less commercial importance.

The Poor Roads of Argentina.—The surface of Argentina is largely covered with fine alluvial and wind-blown soil. Throughout the agricultural provinces bed rock almost never comes to the surface and road-building material is lacking. The roads on the Pampa are merely broad strips of land three or four times as wide as our roads, for the teams of horses hitched to the ponderous high-wheeled wagons often are driven six or eight abreast. These pampa carts have enormous wheels, perhaps 10 feet in diameter, and carry immense loads. This style of wagon is a particular response to the soft, unimproved but level roads of the Pampa. The poor roads tend to perpetuate stock raising, for the cattle and sheep can be driven to market or to the railroad station.

The Best Railroad System in South America.—Conditions in Argentina are favorable for railroad building and the country has more miles of railroad than any other South American country. The greater part of the 24,000 miles of railroad is in the agricultural lands of the Pampa, but long lines extend off to the northeast, northwest, and west, connecting with lines to Brazilian cities, to Paraguay, to Bolivia, and across the Andes to Chile (Fig. 178). Despite the ease of building and the low cost of maintenance, the roads to distant regions charge high rates and yet pay small dividends if any. However, next to the temperate climate the largest single reason for the rapid development of Argentina has been its railway system.

Other Economic Activities

The One Important Forest Industry.—The Chaco district of northern Argentina and adjacent lands contain great numbers of quebracho trees whose extremely hard wood is rich in tannin. Formerly the logs were exported and some still are, but the present practice is to chip the wood to small pieces from which the tannin is extracted by the use of hot water or steam. It has grown to an important industry conducted largely by foreign corporations. Among manufacturing industries it ranks high in Argentina, so far as number of persons employed is concerned (about 20,000). The extract is shipped mainly to the United States. One English company owns 5 million acres of forest and grazing land in this region and one Argentine corporation is reported to own 25,000 square miles.

The Lack of Minerals.—The plain of Argentina uplifted from the sea in a recent geological period has not passed through the kind of experience which results in the deposition of minerals (Fig. 169). The mountains along the western boundary may be expected to yield some of the minerals that are found in Chile and Bolivia, with the exception of nitrate, but little is yet known about this region. The most serious lack is the absence of coal and iron. Petroleum has been found in a number of places and is being produced in moderate but increasing quantities near the coast 700 miles south of Buenos Aires. A few minor minerals are obtained, but as a whole it may be said that Argentina has no mining industry. Prior to the World War Argentina got British coal rather cheaply by means of the grain boats which carried grain to England and brought back coal. It is now more expensive.

The lack of coal has at times handicapped the railroads, especially during the World War when the price soared to fabulous heights, and several million tons of wood, cut in the northern forests, were used in the locomotives while many trains had to be discontinued.

The Development of Manufacturing.—The greater part of the manufactured goods used in Argentina come from the United States and Europe, but certain lines of manufacturing are growing up within the country. The wine industry of Mendoza, the sugar industry of Tucumàn, and the quebracho industry of the Chaco have already been mentioned. It would be expected that the forms of manufacturing which can succeed in Argentina would be: (1) those using the raw materials produced in the country; (2) those requiring a comparatively small amount of coal-driven machinery; (3) those demanding a relatively small force of technically-skilled employees; and (4) those producing articles that have high value in proportion to weight and can stand the cost of exportation to distant markets. It will be seen that the leading manufactures fulfil these requirements. They are meat and other animal products, flour, and quebracho extract, all of which are produced for export as well as for home consumption. The meat industry is the largest and the packing plants are mostly financed by American and British capital. At least four of the Chicago packing companies have built plants in the ports of Argentina. Besides these industries, which are mainly concerned with the export trade, there are others which manufacture almost wholly for home consumption, including the manufacture of leather, woolen goods, shoes, clothing, and wine. A high protective tariff is designed to encourage home manufactures and is partly responsible for the high prices of all manufactured goods in Argentina.

Foreign Trade and Ports.—Prior to the World War, Argentina was one of the few countries of the world that had an annual foreign trade equal to $100 for each person in the country. It is now nearly double that value, and totals nearly two billion dollars a year. The country sells considerably more than it buys abroad and sells more largely to Great Britain than to the United States, mainly because the latter country produces about the same commodities, and does not need to buy so heavily as does a country like Great Britain. Imports are more largely from the United States than from Great Britain. Imports are, of course, manufactured goods—especially textiles and iron and steel products. The leading exports are wheat, corn, flaxseed, wool, meat, hides and skins; agricultural and animal products constitute 98 per cent of the exports. The greater part of the foreign trade of Argentina passes through Buenos Aires, the leading port of South America and one of the great world ports.

Rosario, farther north on the Paraná River, and Bahía Blanca, a seaport south of Buenos Aires, are the other important exporting points (Fig. 183).

Conclusion.—With its temperate climate, level land, fertile soil, coastal location, extensive railroad system, stable government, white population, and rapidly-growing wealth, Argentina has the making of a great nation. However, there are a number of seriously unfavorable conditions. The land is too largely in the hands of a few and is too indifferently tilled by a migratory and discontented tenant class. Wealth and population center too much in the capital where the rich live in extravagance and display, and the poor live in squalor. The contrast is even more striking than in our own New York. Too little is done for the education of the children of the common people; too much foreign capital and too little home capital is invested in the railroads and other large undertakings except farming and grazing. A growing antagonism is shown by the masses toward foreign capital and toward the wealthy class whose members spend money lavishly and with much display. Buenos Aires is one of the most expensive cities in the world in which to live.

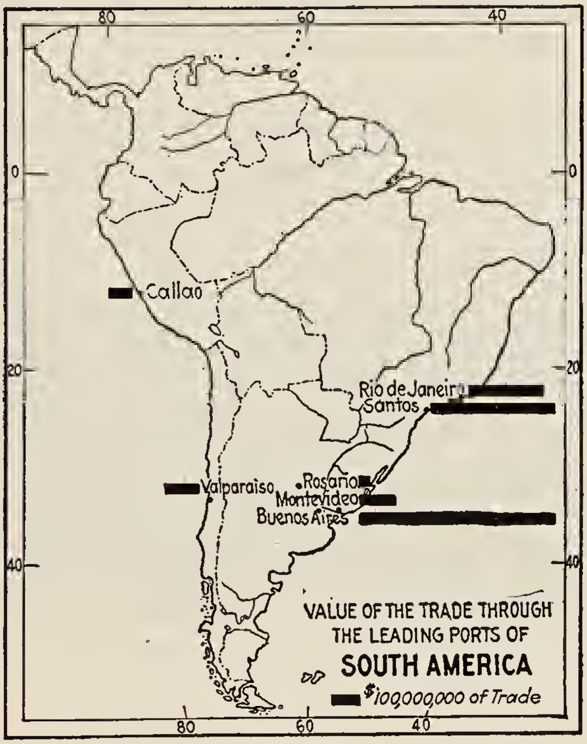

80
60
40
0
0
20
20
40
40
Callao
Rio de Janeiro
Santos
Valparaiso
Rosario
Montevideo
Buenos Aires
VALUE OF THE TRADE THROUGH THE LEADING PORTS OF
SOUTH AMERICA
$100,000,000 of Trade
80
60
40

Fig. 183.

URUGUAY

Character of the Country.—Uruguay, the smallest of the republics of South America, has a million and a half people, most of whom are white; thus in the racial make-up of its population it is more fortunate than any other South American country except Argentina, to which it is similar in physical features. It is a rolling, grassy plain with almost no forests. About 5 per cent of its area is under the plow, and only 6 or 7 per cent of the people cultivate land. Mild in temperature because of the influence of latitude and ocean winds, well supplied with rainfall about 6 years out of 7, surrounded on three sides by navigable waters, and situated at the southern terminus of one of the principal ocean trade routes, the little country is distinctly favored by its geography, as well as by the characteristics of its people.

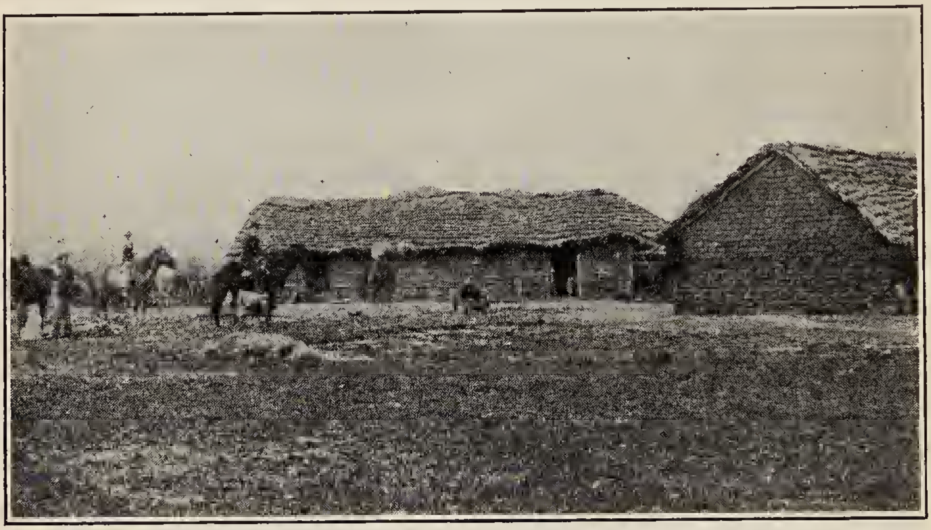


Fig. 184.—Ranch houses in Uruguay made of sods and thatch; a country with little timber. (*Copyright Keystone View Co.*)

The One Dominant Industry.—Uruguay is one great pasture upon which graze nearly 20 millions of cattle and sheep. In no other country do the pastoral industries so completely absorb the interests of the whole nation. Taking cattle and sheep together there are 13 times as many as there are people, and animal products—hides, wool, meat and meat extracts—make up most of the value of the exports of the country. Agriculture is slowly gaining but most of the Uruguayans dislike the hard labor involved in farming, and consider a life on horseback among flocks and herds on the open plains the only life really worth while.

Other Economic Conditions.—Uruguay has made a little progress in the less technical phases of manufacturing, but still is mainly dependent upon imported manufactures, as all Latin-American countries are. Meat packing, meat freezing, meat salting, and the making of meat extracts are the leading industrial enterprises. Montevideo, the capital and chief port, is a thoroughly modern city. The railroad system of English construction converges on Montevideo and reaches out fanlike throughout the country. The per capita foreign trade is exceedingly large as it also is in Argentina, Australia, New Zealand, and similar countries with large producing power and small populations. The droughts and locusts, referred to in connection with Argentina, at times cause great losses in Uruguay. For example, 5 million sheep perished in one season from lack of food due to drought. On the whole Uruguay is an alert, progressive, and promising country.

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CHAPTER XXII

BRAZIL AND PARAGUAY

BRAZIL

Outstanding Facts.—Brazil, the giant of South America, is nearly a hundred times the size of Portugal of which it was once a colony. It is larger than the United States without Alaska, and is three times the size of Argentina. Its 35 million people include: (1) a small minority of descendants of old Portuguese families; (2) immigrants from the south of Europe; (3) a larger number of negroes and persons of mixed negro and white ancestry; and (4) Indians and persons having an admixture of Indian blood. The color line is not at all closely drawn. Popular education is neglected, and a very large per cent of the population is illiterate.

All but the southeastern corner of Brazil lies within the tropics, and about half the national domain consists of the jungles of the Amazon Basin. Yet there is an area in the south and east which is five times the size of France, where the altitude of the region tempers the heat and makes a white man's country; four states in this section contain nearly half the population of Brazil.

The location of the country is more favorable for commerce than is that of the west coast countries, and its natural resources are exceedingly large. The government is stable but is likely to be extravagant in public expenditures. The development of Brazil will require much outside capital, large European immigration, and a great extension of railways, although the majority of the present lines do not yet pay.

The Importance of Topography.—The southeastern third of Brazil is an ancient mountain region, subdued by ages of weathering and erosion and now forming a dissected plateau whose rolling surface is 2,000 to 4,000 feet in altitude. In the region of Rio de Janeiro and Santos, the coast ranges rise almost out of the sea, and 30 miles back, the land is 2,500 to 3,000 feet high. The mountains with their deep valleys make a difficult country for railroad building, but the highlands make a fairly temperate region of what would otherwise be a tropical one. Along the coast or on these highlands live nearly 90 per cent of the people of Brazil. The vast Amazon jungle contains only scattered Indian tribes and the white men who go there for rubber or for some temporary purpose. About half of Brazil has a humid tropical climate in which vigorous and energetic people do not care to live.

Climatic Advantages and Disadvantages.—Only within or near the tropics with their moisture and heat can certain products be grown; among these are rubber, cacao, coffee, copra, bananas, and cane sugar, and all of these grow well in some part of Brazil. No place in the world is so favorable for coffee (Fig. 185). The Amazon forest is the largest source of wild rubber in the world, though this has been largely displaced by plantation rubber from the Far East. The lowlands of the East, mainly south of Bahia, are now the largest source of cacao in the western hemisphere. In the southern uplands cattle can graze the year around and require no artificial shelter. The people of even the cooler regions require little if any heat in their houses, and need much less expensive houses and clothing than people of the United States require. All this is favorable, yet a soft climate does not produce an energetic people, and Brazil suffers from the lack of that tonic effect which cold winters bring.

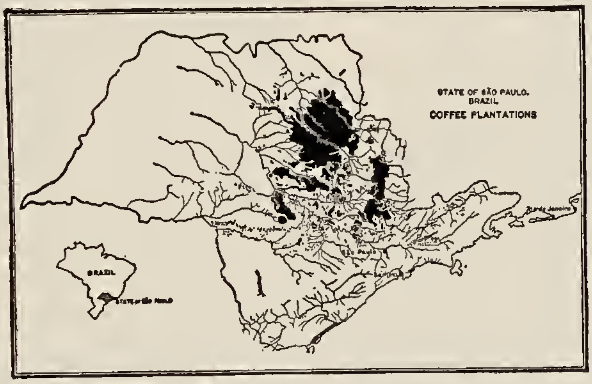

Fig. 185.—Black area represents the coffee-growing region of the state of São Paulo, Brazil. Distance across map, east to west, about 650 miles. (*U. S. Dept. Agr.*)

The Amazon and Its Rubber Forests.—The Amazon has the largest volume of any river on earth, though it is not so long as the Mississippi-Missouri. It flows nearly parallel to the equator and not far from it, and its basin receives the exceedingly heavy rainfall characteristic of the doldrums (Fig. 175). From December to May the rainfall is so heavy and the floods so high that rubber gathering in the lowlands ceases. The climate is hot, sultry, and unhealthy at all times; the vegetation is so dense that the forest can scarcely be penetrated except along the river courses and along the paths cut from tree to tree by the rubber gatherers (Fig. 186). In the number and size of its tributaries, the Amazon has no equal. The gradient is very slight—a fall of only 35 feet in the lower 2,000 miles of its course, throughout which the water is from 100 to 200 feet deep. Contrast this with the Mississippi which with difficulty is kept 10 or 12 feet deep between New Orleans and St. Louis. Practically the only means of transportation in the greater part of the Amazon Basin is by the rivers.

Among the 80 or more species of trees that thrive in the Amazon forest, are four kinds of rubber trees, the chief of which is the *hevea brasiliensis* which secretes the latex from which the best rubber is obtained. About a century ago the first commercial shipments came down the Amazon. Year by year the demand for rubber increased, and by 1880 the Amazon forests were yielding 9,000 tons a year; and in 1910, 40,000 tons; but this did not supply the demand and the price rose to $3 a pound. Soon the competition of plantation rubber grown in Malaysia began to be serious, and a few years later the plantation product exceeded in quantity that from the Amazon; the price turned definitely downward and reached such a low figure that there was little or no profit in collecting rubber in the tropical forests, and the Brazilian production fell off. Now plantations in southeastern Asia and nearby islands supply more than 90 per cent of the world's rubber.

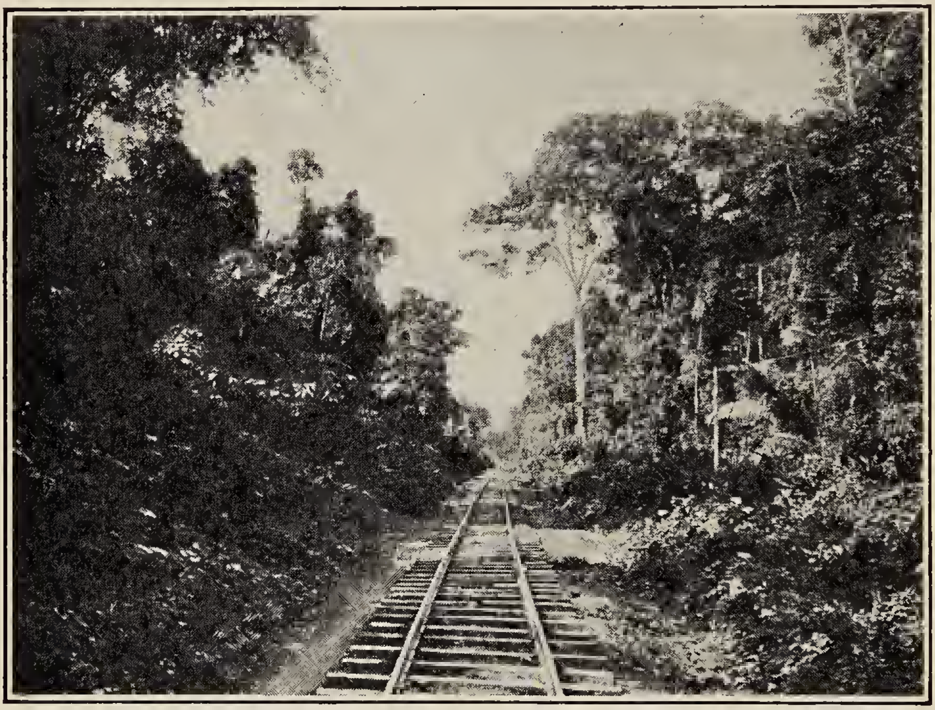

FIG. 186.—A view in the rain forest of the Amazon basin. A section of the Madeira-Mamoré railway. (*Pan American Union*).

Other Forest Products.—Over half of Brazil is forested and the forests include valuable cabinet woods—mahogany, ebony, and rosewood—but these trees are widely scattered through the jungle, one here and one there, and the expense of finding them, cutting them, and getting them to the rivers and to market is so great that there is little profit in the undertaking.

The Brazil-nut tree with its pods holding 20 to 30 nuts is common, and a million dollars' worth a year are exported. Southern Brazil is the native home of the *herva matte or yerba maté,* a shrub whose leaves are extensively used as tea in this region and in Paraguay, Uruguay and Argentina; the Brazilian state of Paraná exports millions of pounds a year. An effort has been made to develop a market for it in the United States, but without success.

In the three southern states of Brazil are extensive forests of pine estimated to cover 100 to 200 million acres. The need for lumber and timber in Argentina and Uruguay is stimulating the cutting of this pine for use in these countries; it is one of the few places in South America that can supply such lumber.

THE DOMINANT PLACE OF COFFEE

Magnitude of the Industry.—In no other large country does a single product dominate the economic life of the nation as coffee does that of Brazil. The coffee planters constitute the aristocracy of the nation, whose prosperity rises and falls with the income from the annual sale of 12 to 15 million bags of coffee (132 pounds to a bag). (When coffee prices are low the whole nation is depressed, and when they are high nearly every other business throbs with renewed life.) Practically all the coffee is raised in a relatively small area back of Santos and Rio de Janeiro (Fig. 185). There are nearly two billion coffee trees, growing on a few million acres of land which, if combined into a compact area, would occupy only a quarter of Ohio. This area—more than half of it in the single state of São Paulo—grows 63 per cent of the world's coffee (Fig. 187), and supplies about two-thirds of the entire value of Brazilian exports.

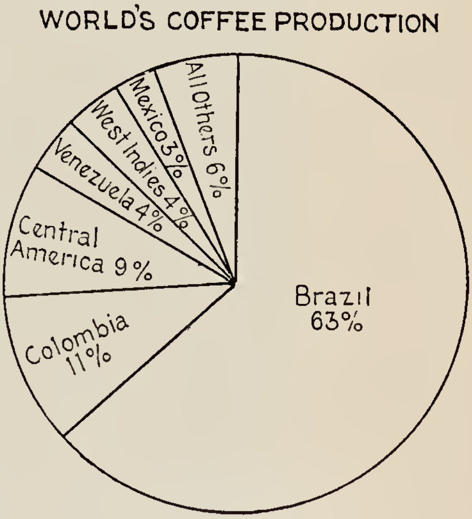

FIG. 187.

The Exacting Demands of the Coffee Plant.—While coffee will grow in most tropical uplands, it demands a very specialized environment to be at its best. (1) It must grow in a region where frosts are infrequent, for heavy frosts ruin the trees; yet (2) it thrives best on the cooler outer margins of the tropics or just beyond in the edge of the temperate zone where pests and diseases are less injurious; (3) it grows—not in the valleys, but on the hills and hill slopes where both air drainage and soil drainage are good; (4) it thrives in the deep red soil of decayed volcanic rocks rich in iron and potash; and (5) it needs a climate with a dry

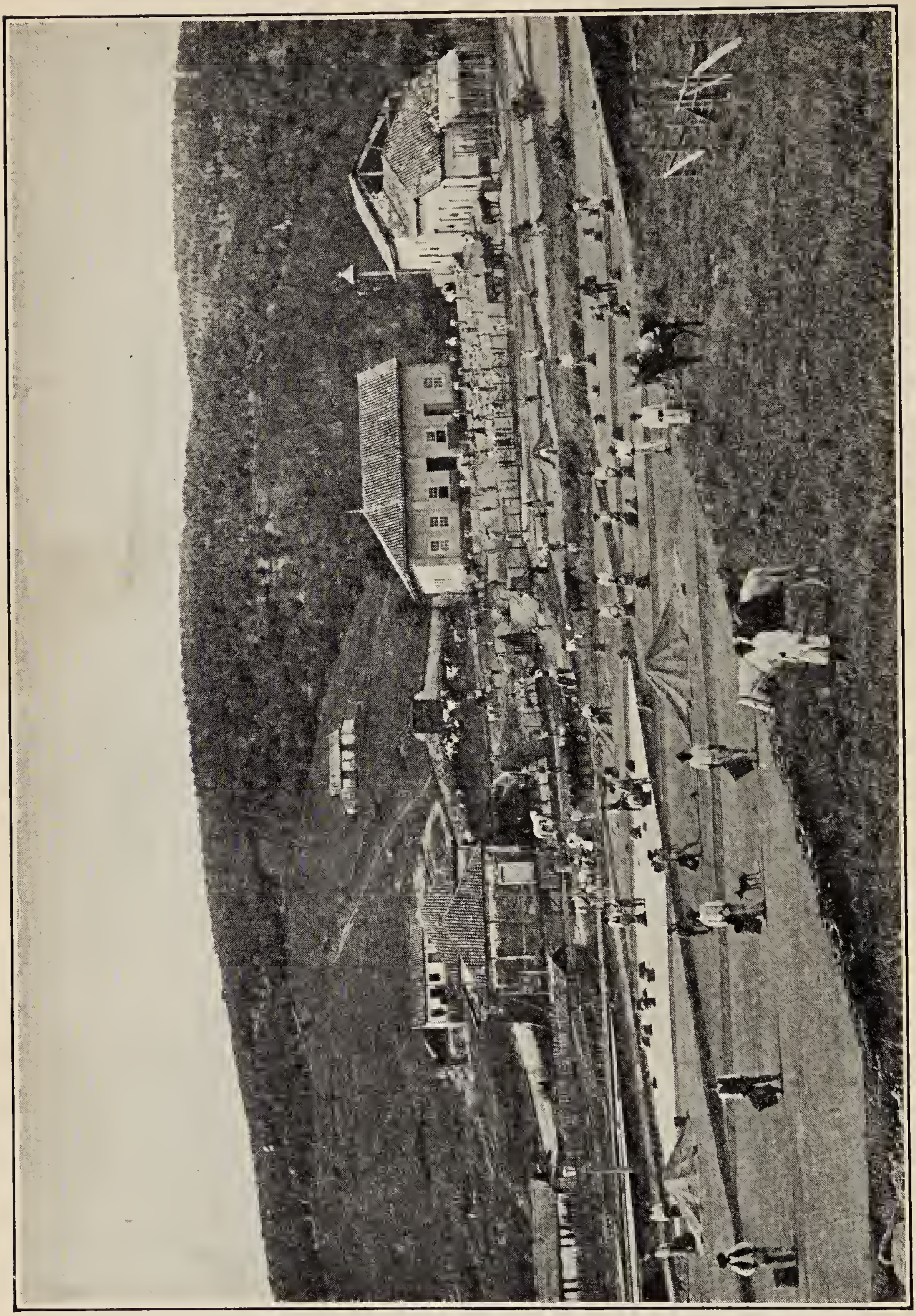

Fig. 188.—A coffee plantation on the hilly upland of São Paulo, Brazil. Coffee trees clothe the upper slopes; the drying floors and buildings of the fazenda occupy the valley. (*Pan American Union*).

season during which the crop can be spread in the open air to dry without too great danger of rain (Fig. 188). Writing of the peculiar combination of soil, climate, and topography found in southeastern Brazil, Professor Ward writing in 1911 says:

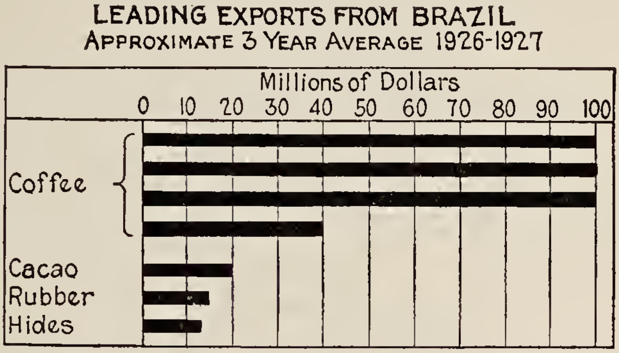

FIG. 189.—Exports of coffee from Brazil are 17 times more valuable than exports of cacao, the next most important item in the list.

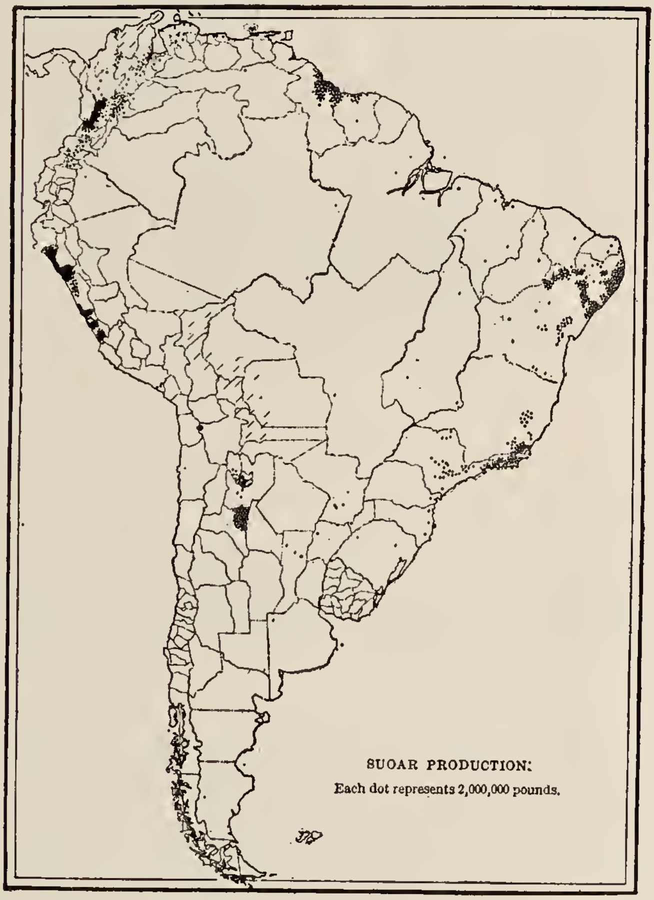

FIG. 190.—Sugar-producing areas of South America. (*Pan American Bulletin*).

"Nowhere else in the world does coffee grow more luxuriantly; nowhere does it find more congenial climate; nowhere does it require less care; nowhere else is it more free from enemies. Such a condition of things is unique; it is phenomenal; it irresistibly attracts the traveler. It matters little in such a country whether there are (as statistics say) 15,000 coffee plantations.[1] It matters little whether there are 600,000,000 or 700,000,000 coffee trees. It matters little whether the invested capital is $500,000,000 more or less. It matters little, because figures mean little to most of us, and because the vastness and the extent and the importance of the coffee industry are here so obvious without any statistics."

Growing and Marketing the Coffee.—On a shrub which attains a height of 15 or 16 feet, grow red berries the size of a cherry within which are two flat-faced coffee seeds. The shrubs, started in nurseries and afterwards set out in rows, are mainly grown on plantations of large size, sometimes covering 5,000 to 10,000 acres or more. On the great plantations live perhaps several hundred laborers' families in villages maintained by the proprietor. In the picking season two or three thousand laborers may be needed. After picking the berries, the red pulp and the inner coverings must be removed by machinery, the coffee seeds must be spread out on drying floors of cement or brick, and there be exposed to the air and sun until they are perfectly dried; after this the coffee is bagged and hauled on ox carts to the nearest railroad if one does not reach the plantation.

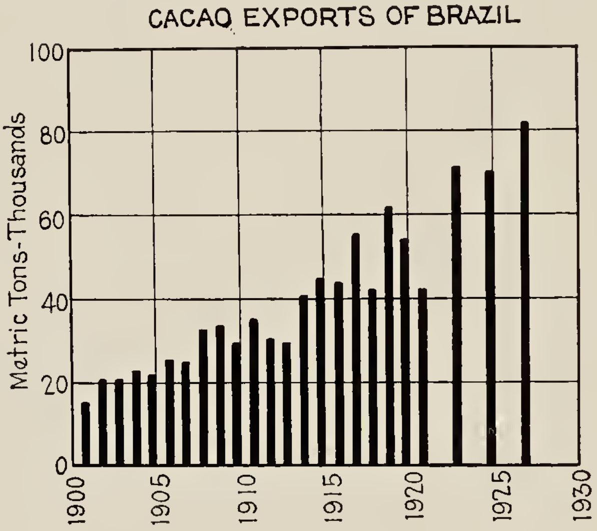

FIG. 191.

Most of the coffee goes for export to Santos or Rio de Janeiro—especially the former, which is the world's leading coffee port. Each year 800 to 900 million pounds are sent to the United States, the greatest consumer of coffee (Fig. 189). A serious difficulty encountered by the coffee planters is that of securing enough laborers when they are needed. In an effort to provide these laborers the government has encouraged immigration from Italy, Spain, and Portugal, even paying the passage

[1] All these figures have increased since the article appeared in the Bulletin of the American Geographical Society in June, 1911, vol. 43, p. 431.

of the immigrants, yet there is always a shortage. Occasionally an overproduction of coffee starts prices downward and then the government has had to resort to various expedients, such as buying and storing part of the coffee and withholding it from market until the price advanced. At times the state of São Paulo has attempted to prevent any further planting of coffee trees until the danger of overproduction was passed.

Possibilities of Plantation and Range.—Only a minor part of the agricultural and grazing land of Brazil is in use. The country has enormous possibilities if labor, capital, and transportation can be provided. There is much undeveloped sugar land (Fig. 190), cacao land (Fig. 191), cotton land (Fig. 192), tobacco land, and general farming land. In the southern third of the country there are 30 million cattle, 15 million hogs, 14 million sheep and goats, and two or three times as many could be raised. The cattle are of inferior quality and the herds need crossbreeding with better stock. Southern Brazil may become one of the important sources of the world's meat. Several packing houses—part of them American—have already been erected in this region.

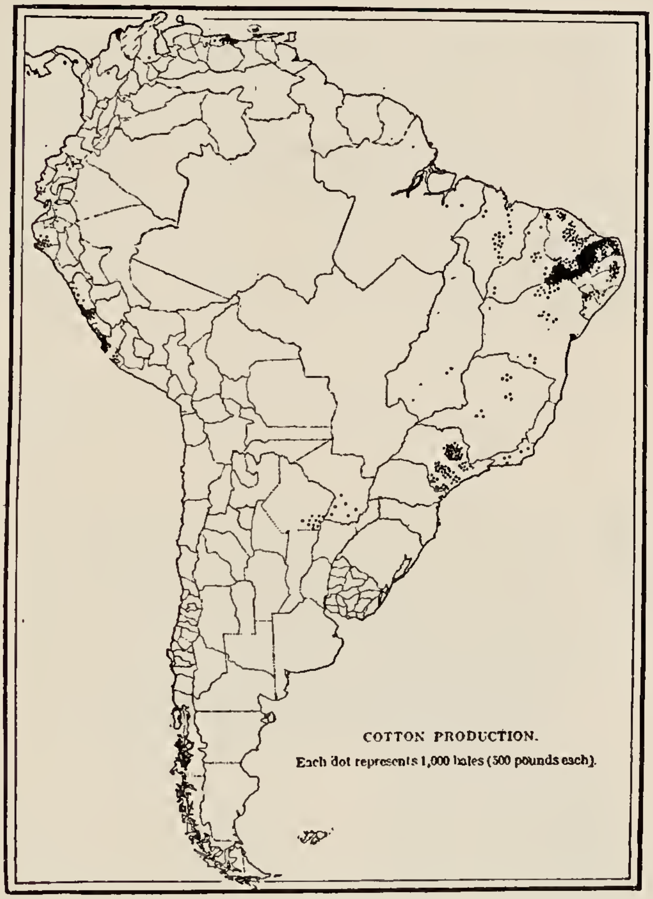

Fig. 192.—Cotton-producing areas of South America. (*Pan American Bulletin*).

Other Economic Activities

Mineral Industries, Past and Future.—For a century and a half Brazil supplied the greater part of the world's diamonds, but when the remarkable mines of South Africa were discovered, the Brazilian output declined. In colonial days Brazil was an important source of gold and is reported to have yielded 500 million dollars' worth of the precious metal, but only one Brazilian gold mine—and that one a mile deep—is now operating profitably.

Brazil supplies the larger part of the world's monazite, a mineral from which the Welsbach gas mantle is made. It is also a producer of manganese, which is essential in the manufacture of steel. In the extreme south are coal deposits of low grade, not yet very useful or accessible. The lack of coal is a serious obstacle to the industrial development of Brazil. During the World War, half of the railway locomotives had to use wood. Southeastern Brazil, however, with its heavy rainfall and rapid streams, is rapidly developing its water power which is becoming a partial substitute for coal.

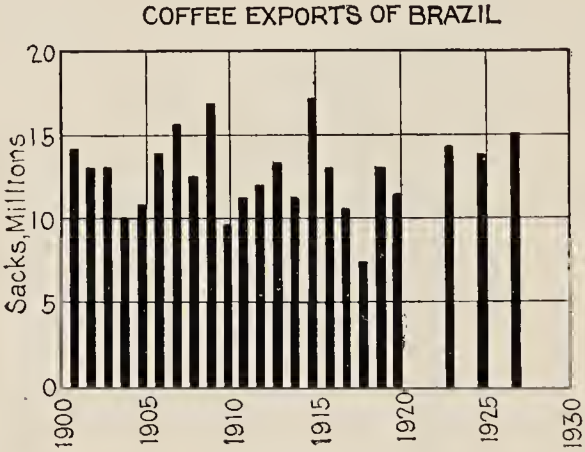

Fig. 193.

Of all the known mineral resources of Brazil, iron is by far the most important. Recent investigations have shown that in the state of Minas Geraes, about 350 miles from the sea, are iron ore bodies of exceptional size and value. Not only are the ores of the highest grade, but they are at the surface of the ground. Unfortunately, Brazil has no coking coal, and most of the ore, when mined, will probably be taken to Europe, and coal brought back in the same ships. The Brazilian iron ores are measured in billions of tons and are among the most important deposits of Bessemer quality in the world. They are mostly controlled by American, English, and French capital. It will be noted that the mining activity of Brazil is a matter of the past and of the future rather than of the present.

The Growth of Manufacturing.—Nowhere in South America has manufacturing progressed far, but under a very high protective tariff it has made more progress in Brazil than elsewhere. Factory production is restricted to a relatively small list of articles, foremost among which are textiles, clothing, hats, shoes, cement, tobacco, and matches, made especially in the region tributary to the cities of São Paulo and Rio de Janeiro, and within these cities. In 1926 there were 329 cotton mills employing 125,000 persons, and making goods valued at $140,000,000. From 200,000 to 225,000 people (a small percentage of the population) are engaged in manufacturing, and the output is valued at nearly a billion dollars a year, about equal to that of Cleveland, Ohio. This is a small value of products per worker and indicates that efficient modern machinery and methods are not, as a rule, employed. Manufacturing on a large scale calls for capital in large amount, skilled labor, trained mechanics, engineers, and superintendents, highly perfected transportation, abundant raw materials, and a great fund of accumulated experience on the part of managers and directors. These advantages are matters of growth under favoring conditions and no South American country has yet supplied these favoring conditions.

Brazil as a Commercial Nation.—Argentina has only a third of the area and population of Brazil, yet it has a larger export and import trade. Brazil is not a country of large per capita wealth, though it has greater natural (but undeveloped) wealth than Argentina, and in the long run Brazil may surpass Argentina. So varied are the productions of Brazil that it is more nearly a self-sufficient country than Argentina, and does not need to buy so many things abroad. Brazil's railroad system, although excellent in the coffee region, is inferior to that of Argentina.

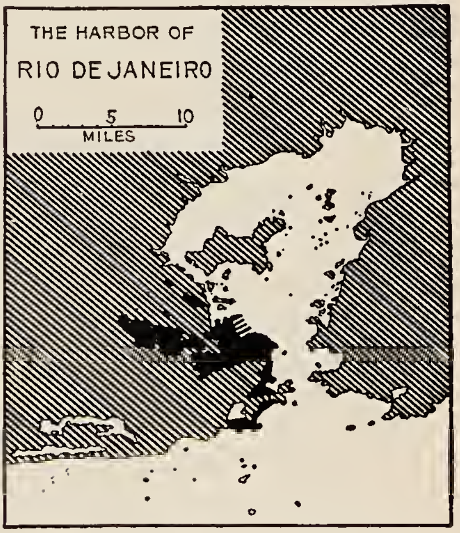

Fig. 194.—The large and protected harbor of Rio de Janeiro.

The export trade of Brazil consists largely in the sale of the products of forest, plantation, and range; mineral exports are small and the export of manufactures is practically nil. Coffee makes up fully two-thirds of the total. The United States is the largest purchaser of the exports and the largest contributor to the imports. The balance of trade with the United States is heavily in Brazil's favor. More than two-thirds of the overseas trade passes through the two ports of Rio de Janeiro (Fig. 194) and Santos, followed by Pernambuco and Bahía, farther north. Although the commerce of

Brazil exceeds 800 million dollars a year, it is only a third of that of Canada.

Conclusion.—A nation's economic progress is, of course, influenced by a great many different factors, some of which are inherent in the geography of the country and can not be modified very greatly by the inhabitants. These factors include the size of the country, its climate, its surface configuration, its geographical situation, and its sources of natural wealth. Another group of factors includes those which arise from the character and abilities of the people who make up the nation and direct its development. These are the racial and human factors, and they include such elements as ability to maintain efficient government and ability to organize and carry out large undertakings—building railroads, developing mining, building up modern industries and foreign trade.

Having in mind these two groups of factors—the geographical and the human—what conclusion shall be reached with respect to Brazil?

Its great size and great resources are partially but only partially offset by its position in the tropics. Disregarding the lowlands of the Amazon basin, Brazil still has an area several times the size of Great Britain or France, where the climate is reasonably invigorating. The coast line is long and affords many harbors. There is a vast area of productive soil and a wide range of products for which there is a market in the north temperate zone. The mineral wealth is large, but good coal, the most important of the minerals, is lacking; however, the southern part of the country has large potential water power. Good roads and a well-articulated railroad system are lacking except in a small area; but this can be remedied. The government is stable and fairly efficient. A minority of the people are educated and a relatively small group of wealthy men dominate political affairs. There is not yet sufficient capital or sufficient labor to carry development forward with anything like the rapidity that occurred in the United States. A high proportion of Brazilian blood has an African mixture and the color line is not closely drawn.

All in all, Brazil seems to have a future of genuine promise, possibly justifying the belief of some that it is destined to be the leading nation of South America.

PARAGUAY

Paraguay—twice the size of Pennsylvania—has a population of about a million people, the great majority of whom have Indian blood. It is the most backward of the South American republics, due in part to its inland situation and in part to long and bitter wars. It is low, partly forest-covered and partly open grass land. Its capital, Asunción, is an unpaved, unsewered town of about 100,000 people, reached by one poorly-built railroad from the south. Most of the small external trade of the country is carried by river boats on the Paraguay and Paraná rivers which connect with Buenos Aires.

Only a few lines of industry have been developed; they are (1) the raising of cattle, (2) the production of a small quantity of sugar and tobacco, (3) the production of oranges which grow practically wild and very abundantly, (4) the growing and gathering of herva matte (yerba maté), often called "Paraguay tea," and (5) the production of the valuable tanning extract, quebracho.

Meat Products.—It is estimated that there are four times as many cattle as people in Paraguay but the cattle are of an inferior quality. Three foreign-owned meat canning plants were established during the World War, but they were afterwards closed.

Yerba Maté.—This is a small tree already referred to as growing in Paraguay and southern Brazil. Its leaves when dried and pulverized make a tea which is much in favor in parts of South America. So large is the demand for it that foreign corporations have acquired large tracts of land and are developing plantations after the model of coffee estates. One company has a capital of 5 million dollars and owns 8,000 square miles of land. Another has a plantation of 2,400,000 trees.

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CHAPTER XXIII

THE CONTINENT OF EUROPE

Europe's Dominating Influence in the World's Affairs.—In spite of its small size, Europe has attained a dominating place among the continents (Fig. 195). It is a remarkable fact that the peoples of this particular continent have extended their languages, civilization, and political ideas throughout the world. Both Americas have been conquered and occupied by Europeans and their descendants. Almost all of Africa is under European rule; and Australia and nearly all the islands of the sea are under the control of Europeans or of Americans who are descended from them. The greater part of Asia is under the rule of European govenments; but Asia alone of all the continents has independent, non-European nations of importance, and only one of these—Japan—holds a place of influence. So far as political and commercial control is concerned, the world has passed under the domination of Europeans. Their mental and moral qualities, their power of organization, their inventiveness, and their grasp on scientific knowledge are of a higher order than has been attained by any other part of the human race although the Japanese are making rapid progress in the same direction, and the Chinese seem also to be potentially a great people.

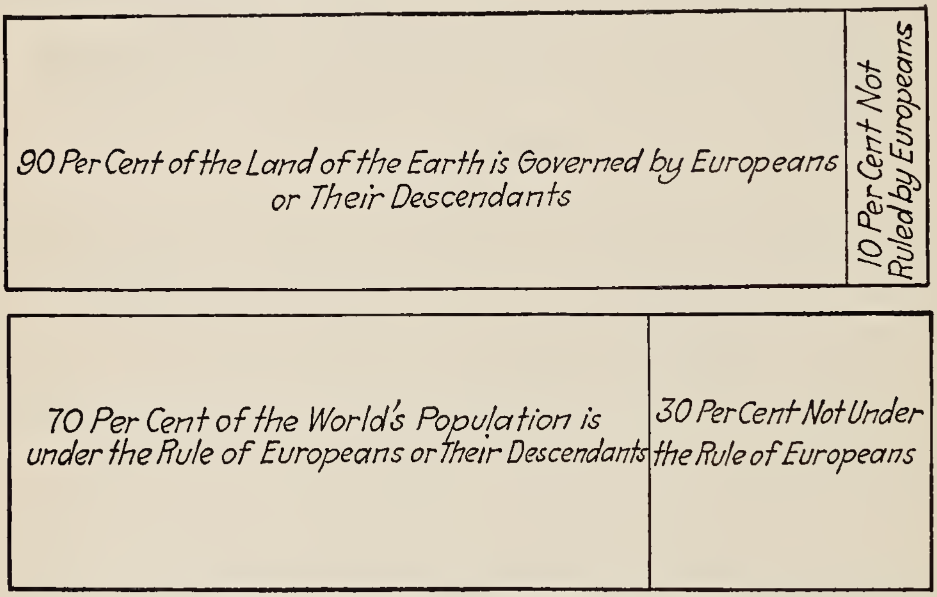


Fig. 195.—The population of the world dominated by Europeans and their descendants is evidence of the energy and ability of these peoples.

Europeans in Other Continents.—Six European peoples have extended their influence over the greater part of the earth: (1) In this the British lead; North America, Australia, New Zealand, India, more than a third of Africa, and hundreds of islands are governed by men who speak the English language (Fig. 213). (2) Spain once had the greatest colonial empire in the world, and from the Rio Grande to Cape Horn, Spanish is the official language everywhere, except in Brazil. (3) Portugal gave its language and culture to Brazil and still holds colonies of large extent in Africa. (4) Holland was long a colonizing power of the first order, and still holds the most valuable group of tropical islands in the world—the Dutch East Indies. (5) France won and lost an empire in North America, and more recently has won another in Africa, and holds islands in many seas. (6) Lastly, Russia pushed her conquests eastward until half the continent of Asia acknowledged her rule. These vast areas that are or have been European colonies have ties of many kinds that bind them to Europe, and the enormous commerce that moves to and from Europe has been built up in part by utilizing these cultural and political ties. Because the flags and the languages of European countries have gone to all parts of the earth, the commerce of these countries has readily followed.

Europe's Advantages of Situation.—*Climatic.*—No continent could have won the place of leadership that Europe holds unless its climate had imparted mental and bodily vigor to its inhabitants. It is a matter of common observation that only peoples occupying the intermediate latitudes possess that love of endeavor, that power of initiative, that irrepressible ambition, and that keen delight in achievement, which characterize the dominant races. Just how the climatic environment invigorates or depresses, stimulates or enervates people, can not be discussed here, but that it does these things is clear.

Europe lies in the cool part of the temperate zone, in the belt of prevailing westerlies with their ever-changing weather. It lies on the east of the great Atlantic whose waters impart warmth to the passing winds in winter, and they in turn carry it over western Europe. Were it not for the influence of the ocean upon the climate of northwestern Europe, these lands would be another Labrador. Moreover, the ocean winds unobstructed by high mountains carry moisture far into the continent, so that Europe has no desert, and it is the only continent that has none. In short, Europe's geographical position gives to it those elements of climate that have made possible the rapid progress of its people.

Commercial.—A country or a continent, like a place of business, may have a fortunate or an unfortunate location. For purposes of commerce central position means much; it means shorter voyages, lower freight costs, and quicker deliveries. The British Isles occupy the center of the land hemisphere, and all Europe is centrally located with respect to

Asia, Africa, and North America. With the increasing commercial importance of the Pacific, Europe's advantages of location will somewhat diminish.

An Extremely Favorable Coast Line.—No other continent has such a long coast line in proportion to its area as Europe has. A deeply indented coast, permitting arms of the sea to penetrate far into the land, is an immense benefit to commerce under present conditions, and was even more so centuries ago when means of transport by land were extremely poor. Trade between peoples has been one of the most effective ways of interchanging knowledge. Traders with their goods passing from one port to another or from one country to another carried ideas as well as products, and thus the cities or provinces or countries that traded freely came into possession of knowledge which they could apply to their own improvement.

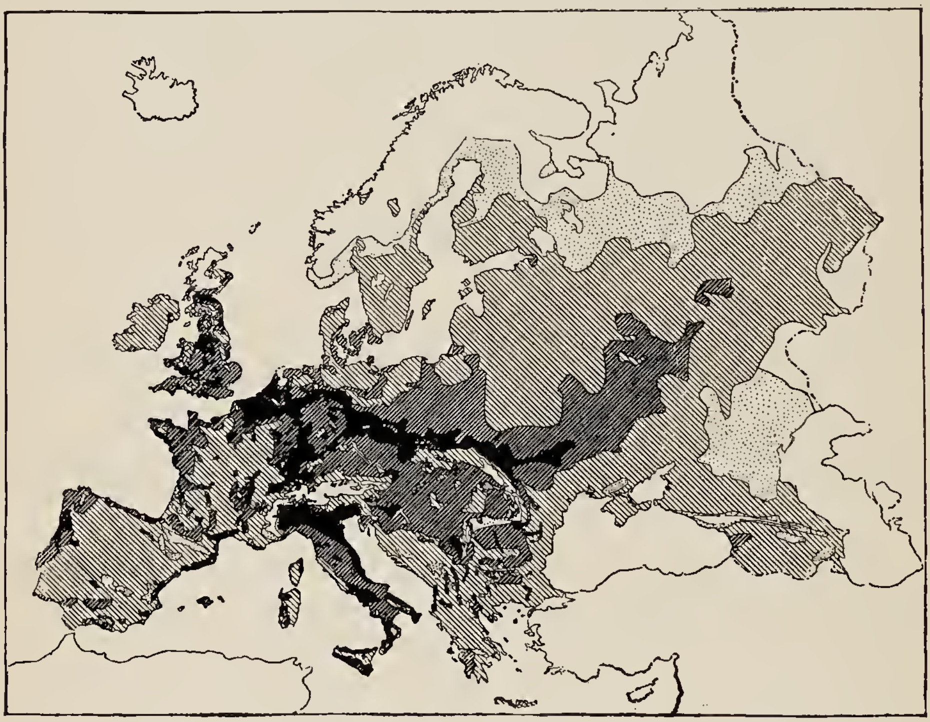


Fig. 196.—Density of population in Europe. Black, very dense, in places reaching 500 or more per square mile; dots, less than 10 per square mile; white, still less dense. (*After Weise in Petermann's Mitteilungen*).

Down to a recent period goods were much more easily transported by water than by land. Regions that were adjacent to the sea had a commercial advantage over regions remote from the sea. Long overland journeys were difficult and often dangerous, and commercial intercourse between distant inland points and foreign countries was very much more restricted than between points on the sea or points at a moderate distance inland. Since the development of railroads, this condition has changed, but the seaport still has a commercial advantage over the inland city. Outside of Russia there is no part of Europe that is far from the sea.

The sinking of the land in western Europe has admitted the ocean more than a thousand miles into the heart of Europe through the North Sea and the Baltic. The Mediterranean and Black Seas, with their narrow but deep entrances, permit ocean vessels to penetrate 2,000 miles from the Atlantic; and the Adriatic and the Aegean have a similar effect. Europe's coast line is one of the great geographical influences that have promoted the progress of that continent.

A Great Variety of Surface Features and Climates.—The mountain systems of Europe are many and widely distributed, and give to the surface of the continent a great variety of land forms and considerable variations of climate. Spain is a mountain-ribbed plateau, high and dry. Italy has its long Apennine chain, its lofty Alpine wall on the north and its rich, level alluvial valley of the Po. Germany and France and Great Britain are half lowland plains and half mountains and foothills. Central Europe is an alternation of plains and mountains. Only Russia has uniformity of surface over a wide area. This diversity of surface and of climate gives to Europe a great diversity of products, a wide range of human occupations, and the basis for much international commerce.

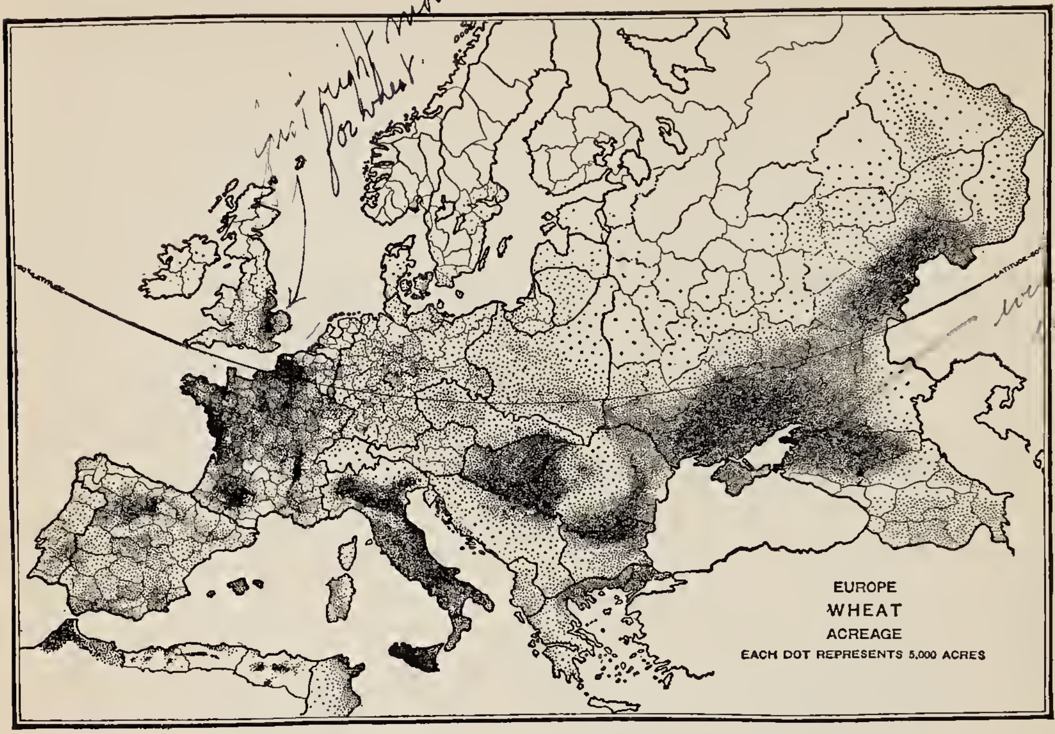
Many Useful Rivers.—Europe has many rivers of sufficient size to serve as waterways, and these have played a large part and still do play a large part in the commerce of the continent. The three main waterways are the Rhine, the Volga, and the Danube. But the Vistula, the Oder, the Elbe, the lower course of the Seine, of the Thames, of the Scheldt, and many of the rivers of Russia also carry a large traffic. In the years before the World War, the Rhine fleet consisted of more than 10,000 steamboats and barges, and the freight carried reached into the millions of tons. The Volga is the great north-south traffic route of Russia, and prior to the Russian Revolution (1917) 12,000 boats in an average year entered the up-river port of Nizhni-Novgorod. The Danube and its tributaries formerly carried great quantities of wheat and the river is still important, though all conditions in the Danube basin were changed by the World War.

In northwestern Europe the sinking of the land deepened the lower courses of the rivers and converted most of them into estuaries which admit ocean vessels for considerable distances, and on these estuaries most of the great ports are located—London, Liverpool, Hull, Antwerp, Hamburg, Bremen, and many others.

The Large and Varied Resources of Europe

Agricultural Resources.—Somewhat less than one-half of the land of Europe is sufficiently level and well drained to be cultivated, but much more than one-half is devoted to the production of crops or livestock.

Denmark - dairy cattle
Ireland - both beads


EUROPE
WHEAT
ACREAGE
EACH DOT REPRESENTS 5,000 ACRES
LATITUDE 50°

just right for wheat production

winter wheat

FIG. 197.—The wheat lands of Europe. (*U. S. Dept. Agr.*)

wheat areas reverse to cattle production areas

cattle [illegible]

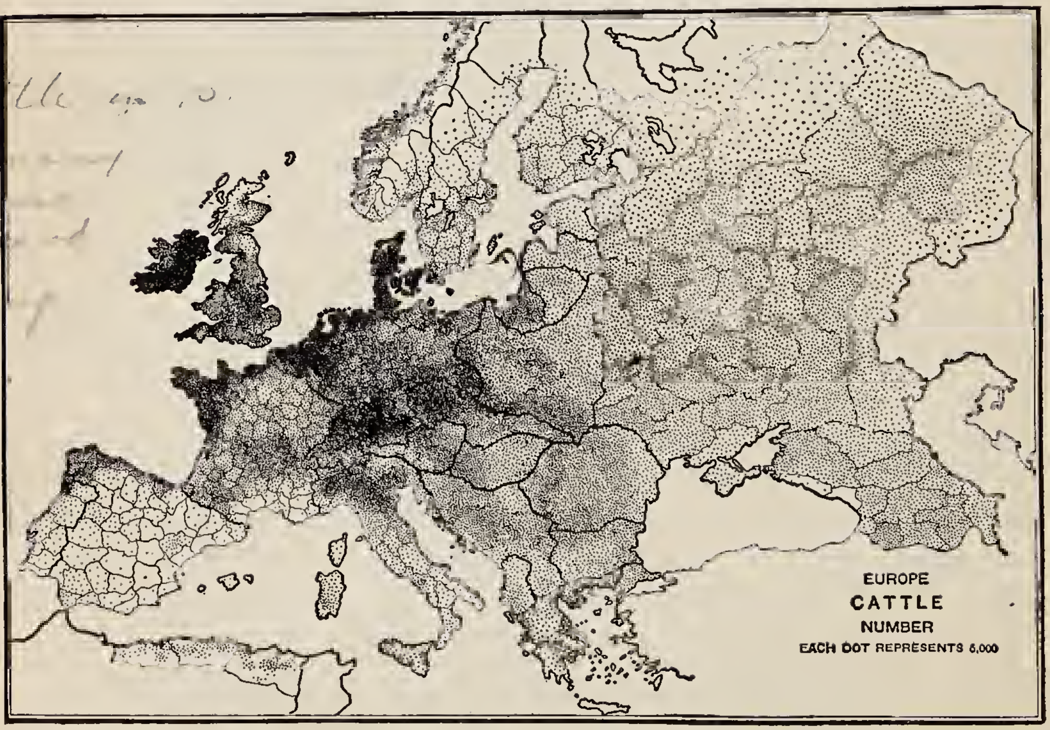

EUROPE
CATTLE
NUMBER
EACH DOT REPRESENTS 5,000

FIG. 198.—Cattle-raising regions of Europe. The humid marine climate of west central Europe is favorable to pastures. The uplands of central Europe also favor grazing. (*U. S. Dept. Agr.*)

The pressure of population in many parts of Europe has forced the people to utilize the land far more fully and productively than land in the United States is used. Land in Europe as a rule is more expensive, and a great deal more hand labor is devoted to the crops; and in western Europe the average yield of crops per acre is much higher than it is in the United States.

The agricultural lands of Europe are the continent's greatest resource, and the quantity of foodstuffs produced is greater than that in North and South America combined. We think of the United States, Canada, and Argentina as great sources of grains, meats, and other food products, yet Europe produces more wheat (Fig. 197), dairy products, and meat (Fig. 198) than all the rest of the world; more than twice as much barley, 9 times as many potatoes, and 24 times as much rye as all the rest of the world. It formerly produced nearly half of the world's sugar. Yet, in spite of these facts, Europe imports more food than all of the other continents together.

Forest Resources.—Northern Europe (especially Sweden, Finland, and Russia) has vast and valuable forests. South Germany, Poland, the old Austro-Hungarian monarchy, and the Balkan countries have large forests, usually amounting to one-fourth or more of the total land area; but the countries of western Europe—England, Belgium, France, Holland, and Denmark—and the Mediterranean lands, with their scant summer rainfall, are deficient in forests. Naturally, the timber has been largely removed from the lands capable of cultivation, but this is not entirely true in Russia or in southeastern Europe. On the whole, however, European countries are importers of forest products, a part of which come from North America.

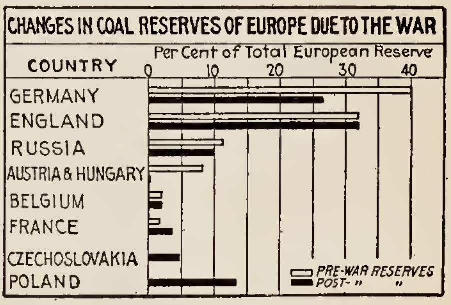


Fig. 199.

Mineral Resources.—Europe is poor in silver, gold, copper, nickel, and tin, and has large petroleum deposits only in the extreme southeast of Russia, near the Caspian Sea. But in the two most essential minerals, coal and iron, Europe is very rich (Figs. 199, 200). Upon this fact too much stress can scarcely be placed, for with all of Europe's other geographical advantages, it could not continue to be a leader in our modern type of world unless it had those two basic minerals in abundance. Both coal and iron are well distributed throughout the continent, except in the Mediterranean basin. Great Britain, Germany, France, Belgium, Czechoslovakia, Poland, and Russia have valuable coal beds. France, Spain, Sweden, Germany, and Russia have valuable iron deposits (Fig. 200), and lesser ones exist in several other countries. Europe has far less than half of the known coal and iron of the world, yet normally it mines more than all the rest of the world (Fig. 201). This is mainly due to the high economic development of Europe. Europe and the United States produce about 95 per cent of the coal and 97 per cent of the iron ore mined in the world. In the production of 14 out of 27 important minerals listed by the United States Geological Survey in its World Atlas of Commercial Geology, Europe is the leading continent.

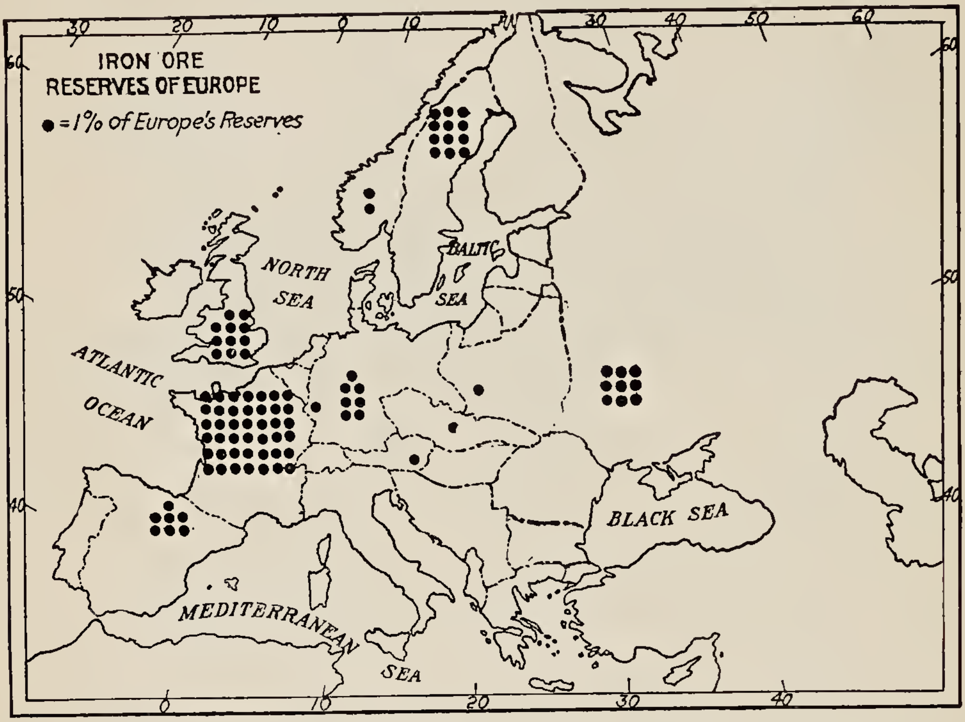

IRON ORE
RESERVES OF EUROPE
● = 1% of Europe's Reserves
NORTH SEA
BALTIC SEA
ATLANTIC OCEAN
BLACK SEA
MEDITERRANEAN SEA
30
20
10
0
10
20
30
40
50
60
60
50
40
0
10
20
30
40

FIG. 200.—France, Sweden and England have about two-thirds of Europe's iron ore reserves.

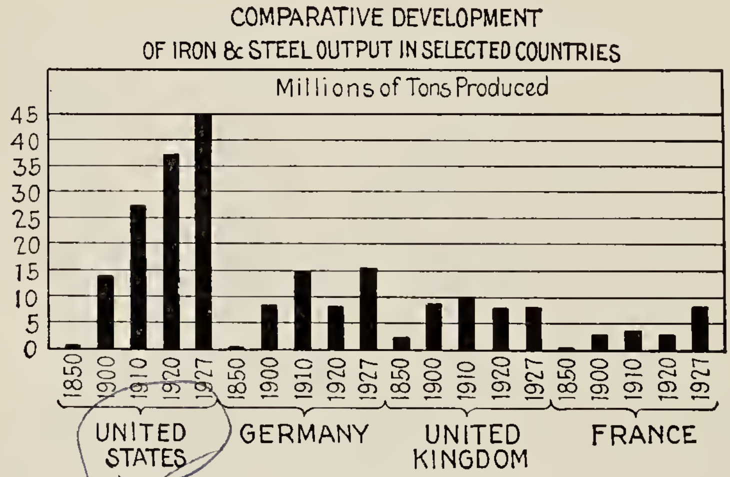


FIG. 201.—The above figures show the production of pig iron. The production of steel is a little greater.

Water Power.—Since the potential water power of a continent depends upon the area of the continent, as well as upon the rainfall and run-off, and the relief of the land, Europe could not rank high in total potential water power (Figs. 106, 202).

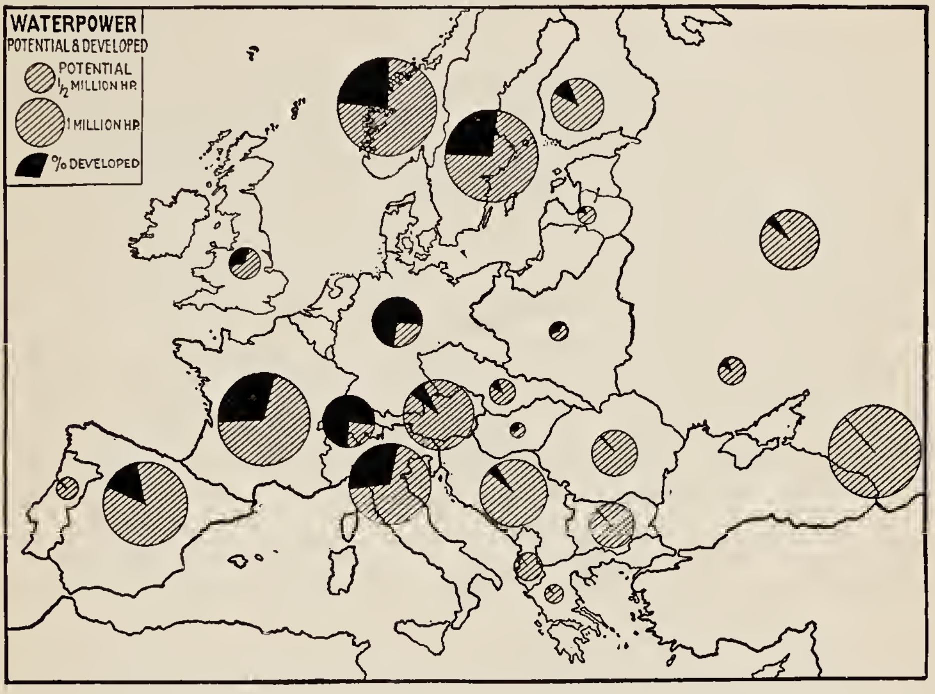


Fig. 202.—Showing the relative importance of potential and developed water powers in European countries. (*Data from U. S. Geol. Surv.*)

Potential and Developed Water Power in 1926[1]

Continent	Developed horsepower	Potential horsepower
Africa	14,000	191,000,000
Asia	2,100,000	69,000,000
North America	16,840,000	65,800,000
South America	751,000	54,000,000
Europe	13,100,000	58,000,000
Oceanica	242,500	17,000,000
Approximate world total	33,000,000	454,000,000

[1] From U. S. Dept. Com. Yearbook, 1928, vol. 2, p. 715.

From the preceeding table it will be seen that Europe ranks second only to North America in *developed* water power. In both these continents about 25 per cent of the potential water power has been brought into use. In Europe two regions yield a high percentage of this power: (1) Norway and Sweden, (2) the Alps and their foothills, regions that are especially poor in coal. It can not be said that the use of water power has yet assumed large importance in the industries of Europe as a whole, although it is increasing rather rapidly.

The Three Economic Regions of Europe

THE NORTH SEA COUNTRIES

A Marine Climate.—It already has been pointed out that the Atlantic Ocean exerts a profound influence upon the climate of western Europe. Note on a map of Europe that the British Isles, the Scandinavian countries, Belgium, Holland, most of Germany, and a part of France, are north of the 49th parallel of north latitude, which is the northernmost latitude of any of the states of the United States. Even the northern boundary of Minnesota and North Dakota are several degrees farther south than London or Berlin. The North Sea countries lie between the parallels of 50° and 60° N. latitude, but they have winter temperatures resembling those of our eastern states which lie nearly 1,000 miles farther south, for example, Virginia and Maryland. These countries have ample rain for agriculture, little snow except on the mountains, mild winters, temperate summers, and ever-changing weather.

A Region of Drowned Coasts and Many Harbors.—The western edge of the actual continent of Europe is out in the Atlantic well to the west of Ireland. The British Isles are a part of the actual continent, and the North Sea and Baltic Sea are shallow parts of the ocean which now cover a part of the North European Plain. A moderate sinking of the land in a past geologic age cut the British Isles off from the rest of the continent and changed the lowest portions of the European Plain into shallow seas. Sinking coasts are usually irregular coasts, with offshore islands and broad river mouths which make good harbors. The North Sea countries have such a coast—an excellent coast for the purposes of ocean commerce. Of 12 leading ports of the world, 6 are on the borders of the North Sea—London, Antwerp, Rotterdam, Amsterdam, Hamburg, and Bremen. More overseas commerce is handled by the North Sea ports than by all the other ports of Europe.

Importance of the Fisheries of Western Europe.—The shallow waters that border the coast of Western Europe are ideal for ocean fishing, and the most productive sea fisheries of the world are there. All of the peoples of the west European coast are engaged in the sea fisheries, especially in the North Sea and off the coast of Norway. Thousands of fishing boats go out from the ports of England, Scotland, France, Norway, and Holland. Cod, haddock, mackerel, herring, and many less familiar fish are caught in enormous numbers; the annual catch by British fishermen alone reaches beyond 2 billion pounds. The ocean fisheries have been one of the most effective of all agencies in making the North Sea peoples a seagoing, sea-loving race. The ocean fisheries are a training school for seamen, an incentive to boat designing and boat building, and the invariable first steps in the making of maritime nations; and all of the North Sea nations are maritime nations. Moreover, the 4 billion pounds of fish caught yearly in these waters constitute a very substantial item in the food supply of Europe, and a not inconsiderable item of commerce.

The North and Baltic Seas Bordered by Plains.—With the unimportant exceptions of a short strip of the Norwegian coast and the Scottish coast, the North Sea is bordered by plains. This, of course, is to be expected when it is recalled that the North and Baltic seas are merely drowned portions of the North European Plain. But (1) the absence of mountains barriers in this part of Europe, (2) the ease with which the rivers can be used for navigation, and (3) the general utility of the land for agriculture, have been favorable to the economic development of the North Sea countries. This condition is quite in contrast with the mountainous lands around the Mediterranean Sea; and the relative decline in the commercial importance of the Mediterranean and the rise of the North Sea countries is, in no small part, due to the geography of the two regions.

The Abundance of Coal and Iron in the Lands around the North Sea.—This region of Europe was highly important commercially before the rise of steam-driven machinery, notably during the period of the Hanseatic League, a league of commercial cities which flourished between the fourteenth and seventeenth centuries in the region around the North and Baltic seas. The greatest expansion of the commerce of western Europe, however, has taken place in the last century—the century of coal and iron. Most of the great coal deposits and iron deposits of Europe are in the lands that surround the North Sea, and practically half of the factory manufacturing of the world is done in these same lands—England, northern France, Belgium, and Germany, especially.

Teutonic (Nordic) Peoples Inhabit the North Sea Countries.—From Fig. 203 it may be seen that all the lands surrounding the North Sea are possessed by peoples of the Teutonic (or Nordic) branch of the white race. There are many groups within this large racial family, but all are descended from the same ancestral stock, speaking kindred languages and possessing many outstanding traits in common. They include the English, Germans, Dutch, Danes, Swedes, Norwegians, the Flemings of Belgium, the German Austrians, a part of the Swiss, and a considerable element in the French, for the original Franks were a Teutonic people. During the Middle Ages Teutonic peoples spread into Italy, Spain, and even into North Africa; they also occupy important parts of Poland, the Baltic states, Russia, Hungary, and what is now Czechoslovakia. The Teutonic peoples have shown great vigor and resourcefulness, a strong tendency toward colonization, toward maritime life, toward commerce, and toward modern industry. They are successful in self-government, democratic, businesslike, practical, and inventive. They demand education and relatively few of them fail to get it. There is some reason for believing that these qualities are in part at least the effect of the climate of northern Europe. The people of the United States and Canada living in a similiar climate preserve and perhaps intensify the strong qualities of the Teutonic peoples in the old world.

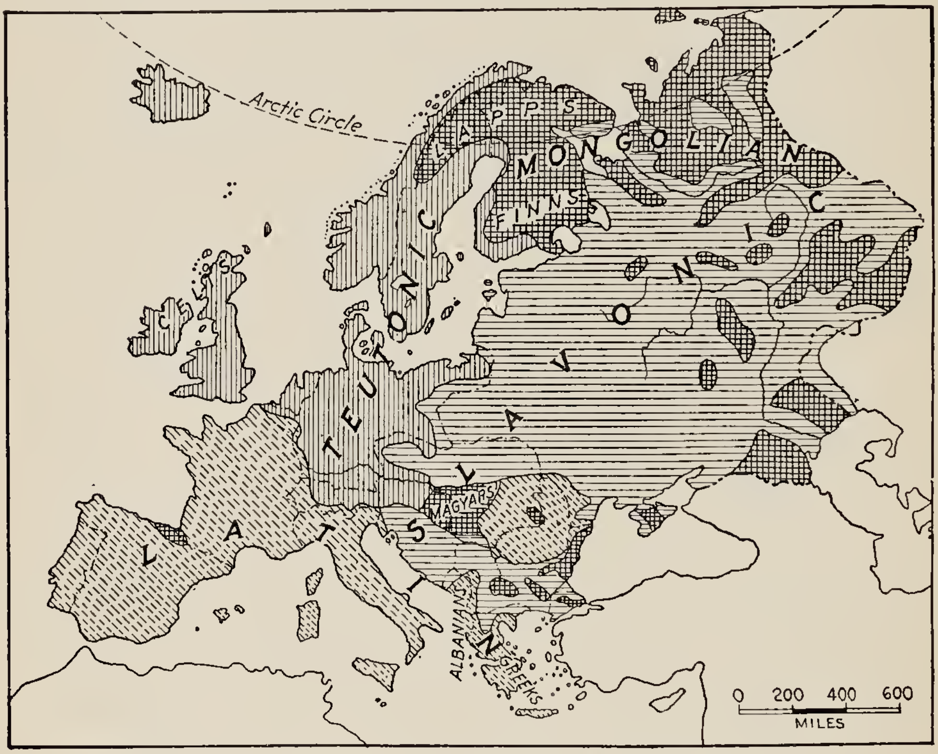


Fig. 203.—Distribution of the principal racial stocks of Europe.

THE MEDITERRANEAN REGION

Past Importance of the Mediterranean Region.—Early European civilization grew up on the shores of this sea, and during the long period when Rome was mistress of the world, the Mediterranean bound together nearly all the known world. It was small enough and had islands and peninsulas at sufficiently frequent intervals to permit the small vessels of that period to navigate its waters. But with the discovery of the new world, and the discovery of the routes around the southern end of Africa and of South America, a new era of navigation began, the Atlantic grew in importance, and the Mediterranean suffered a relative decline. After the opening of the Suez Canal (1869) the Mediterranean again increased in importance as a route of commerce, and is now one of the chief ocean trade routes of the world (Fig. 138).

The Mountainous Shores of the Mediterranean—Unlike the North Sea, the Mediterranean is almost everywhere bordered on the north by mountains and on the south by mountains or deserts. Here there are no broad, fertile plains traversed by navigable rivers. Entrance to the interior of the continent is somewhat difficult, the Rhone Valley in France being the only open gateway from the south. The mountainous character of southern Europe and its dry summers are two reasons for the general poverty of the people, the majority of whom seek to obtain a living from the scanty soil.

The Mediterranean Peoples.—The south Europeans or Mediterranean peoples speak the Romance languages; they are referred to as "Latin" peoples, and on the whole manifest somewhat different traits from those of the north Europeans. They are more temperamental, more artistic and musical, and less devoted to education, to democratic institutions, and to large business enterprises. The mountainous surface and dry summers of the Mediterranean lands increased the difficulties of agriculture, and coal is seriously lacking.

France forms a bridge between Mediterranean Europe and Teutonic Europe; her people speak a Latin language, but manifest Celtic traits with Germanic influences evident. France, though touching the Mediterranean, is to be classed as a north European nation.

EASTERN EUROPE

The three outstanding characteristics of eastern Europe are: (1) it is occupied almost wholly by Slavs (Fig. 203); (2) it is mainly (but not wholly) a region of plains; (3) it is dominantly agricultural, with manufacturing developed to any large extent only on the border states of Poland and Czechoslovakia, which touch the highly industralized country of Germany. Racially, Poland and Czechoslovakia belong to Slavic Europe, but commercially and otherwise they are properly grouped with the industrial countries that find their outlet through the Baltic and North seas.

Eastern Europe is occupied by peoples who came in the last waves of migration from Asia and they are less Europeanized than are the people of western Europe. The greater part of them are peasants with little or no schooling. The upper class of Slavs, however, are educated, artistic, masterful people. The Balkan countries with their mountainous topography, many discordant nationalities, and generally backward conditions, are predominantly Slavic and agricultural, and are to be classed with eastern Europe.

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CHAPTER XXIV

GREAT BRITAIN AND IRELAND

Achievements of the British Nation.—Not only have the English people been able to bring Scotland, Wales, and Ireland (page 342) into a union with England, but with the aid of these they have built up the most extended empire that has ever existed. During the 900 years since William the Norman conquered England (in 1066) the nation has had a remarkable growth. It has met in decisive conflict at least four other great European powers that disputed its command of the sea: (1) Spain, whose Armada was destroyed in the sixteenth century; (2) Holland, defeated in the seventeenth century after three hard wars; (3) France, under Napoleon, finally defeated at Waterloo in 1815; and (4) Germany, defeated in the World War of 1914 to 1918. The rivalry of Russia, at one time threatening, did not involve the command of the sea, for Russia has never been a sea power. Since the British entered upon their colonizing policy they have gone on adding colonies in all parts of the world, until at present the British flag floats over nearly a quarter of the land and over a population of nearly 500 million people. Such achievements as those of the British nation could be attained only by an able people, living in an invigorating climate, and in a land distinctly well located, and well endowed by nature.

The Influence of Location and of Insularity.—No country except France has a situation so favorable for ocean commerce as that of the British Isles. As previously mentioned, they occupy the center of the land hemisphere; they lie at the front door of Europe; they border on the North Sea, the most used of all the commercial seas; and on the Atlantic, the most used of the oceans; and they are the nearest of the European countries to North America. In latitude, they are much farther north than is commonly realized. But, as already indicated (page 329), the prevailing winds from the Atlantic give mild summers and give mild winters to all parts except the Scottish highlands. On an average, London has only 14 days of snow during the year, and no snow at all falls there during some years. There is much rain in Ireland and on the west coast of Scotland, Wales, and England; but on the east coast of England, the annual rainfall is scarcely 25 inches, yet this is sufficient for agriculture. The temperature is cool enough to invigorate, but not cold enough at any season to retard the economic life of the country. The fact that the islands are close to the continent but severed from it has exerted a constant influence upon the country's development. An attack upon

England can be made only by sea, and great standing armies have never been necessary. The defense of the nation rests with the navy which withdraws relatively few men from productive occupations. Since the days of William the Norman, no foreign foe has been able to invade England. Her lands have not been devastated by foreign armies, and her industries have not been crippled. For this her insularity is in part responsible.

The Four Countries Forming the British Isles. *Ireland.*—For centuries Ireland was held in a more or less unwilling relation to the other three countries of the United Kingdom. For many years Ireland demanded home rule, which was finally granted; but before it went into effect, a strong party in Ireland demanded complete independence. A compromise was effected under which all of Ireland except Ulster became a Free State, self-governing, yet continuing as a part of the British Commonwealth of nations, with a status similar to that of Canada. Certain northern counties, forming Ulster, remain an integral part of the United Kingdom, but not a part of the Irish Free State.

Ireland is called the Emerald Isle because vegetation is kept green by the abundant rainfall and mild climate. Low mountains or hills partly encircle the island, not far from the sea, but the larger part of the land is low and level, and a considerable portion is covered with peat bogs. There is a little coal of low grade, but the quantity mined is unimportant. Ireland is distinctively an agricultural and stock-raising country, and only in the north has manufacturing attained any considerable growth. The population declined almost one-half between 1840 and 1910, quite largely due to emigration to America.

Scotland is the most mountainous part of the British Isles, and only 17 per cent of the land is suited to cultivation, as against 33 per cent in England. The rugged, lake-dotted northern highlands are bleak in winter, but delightful in summer; the lowlands—which are of relatively small extent—are fertile, intensively cultivated, and densely populated in the neighborhood of the coal beds, where manufacturing centers have developed; 75 per cent of the people of Scotland live in these central lowlands. With a population of about 5 million, Scotland has a half-million more people than Ireland, but neither has so many as the single city of London. The Scotch element in the British population has supplied a remarkably high proportion of distinguished men.

Wales is small and mountainous and only 15 per cent of the land is adapted to crops. The population is less than 2 million and is increasing very slowly. In the south are coal beds of large extent and high quality—the best in Europe for the use of steamships. On or near these coal fields is one of the important manufacturing sections of Great Britain; it is especially devoted to the smelting and metallurgical industries, including iron, tin, lead, zinc, and copper.

England is the most favorably located and most richly endowed country of the British Isles, and contains over 75 per cent of the people. It is one of the most densely populated of countries, due mainly to the high development of manufacturing. The major part of England consists of rolling plains; the Pennine Range of low mountains in the north is the only highland of importance, but there are other hilly portions. A third of the land is suited to cultivation, but not all of this is cultivated. The resources which above all others have given England its place of industrial leadership are its wealth of coal and iron, upon which the great manufacturing industries are based. The iron is no longer sufficient for domestic needs, but coal has been one of the leading exports.

AGRICULTURE

Britain a Land of Meadows and Pastures.—No other great nation is so dependent on imported food as is the United Kingdom. Yet up to 1800 it was primarily an agricultural country and was an exporter of foodstuffs. Now, less than 7 per cent of the workers in all industries are engaged in agriculture. More than 80 per cent of the land might be productive, yet only about one-fourth of it is cultivated, and part of that is hay land. Much of the remaining productive area is in permanent pasture. This implies a predominance of the animal industries over cereal production. In a country so needful of imported food this seems an uneconomical use of the land, but it is a condition determined by a combination of geographic, historical, and economic conditions.

The cool, moist weather of the British summer is highly favorable to hay and grass production, but it is generally unfavorable to the ripening and harvesting of grains. In 1921, which had the driest summer Britain had seen in 100 years or more, crops generally were poor and the hay crop was the poorest on record. Yet, the wheat crop of England and Wales was very large, and the average yield of 35.3 bushels per acre was the highest ever recorded. Wheat and barley are raised most abundantly on the drier plain of eastern England. Oats are better able to withstand the humidity of Scotland, Ireland, and western England. All the grains are frequently discolored by excessive moisture and are, on the whole, of greater importance as animal feed than as human food. Corn (maize) does not mature in the cool summers of Britain and its place in crop rotation is taken by the root crops (beets and turnips) which are better feed for cattle and sheep than for swine.

The Animal Industries.—In consideration of the general insufficiency of agriculture for the support of the population, Britain produces a surprising proportion of her required meat (around 60 per cent). This is in part due, however, to the importation of quantities of concentrated feed, grains, and oil-seed cake with which to supplement the domestic rough feed of hay, straw, and root crops. Meat production is more economical of labor than is grain farming. As in America, the young men have left the farms for the factories. Moreover, British agricultural labor is unionized, and wages since the war are high. As a result, the tendency toward more intensive agriculture, which might have resulted from the lessons of war time, is checked.

The importance of sheep in Great Britain is something of an anomaly, since sheep are in general the inhabitants of dry regions (Fig. 204). A partial explanation is to be found in the fact that some of the most famous of the sheep pastures are on the "Downs," or low ranges of chalk hills of southern and eastern England where the soil is porous and well drained.

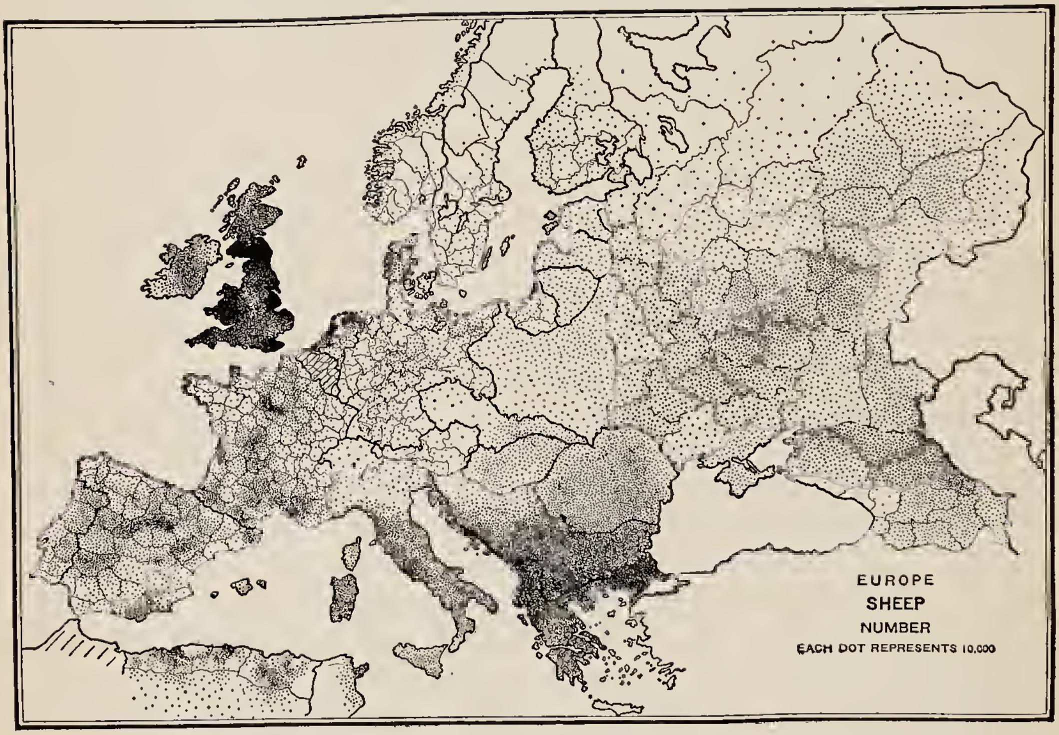


FIG. 204.—Sheep raising in Europe reaches its greatest importance in Great Britain and in the rough, dry lands of the Mediterranean regions. (*U. S. Dept. Agr.*)

In general it is in the hilly lands of Britain where sheep reach their greatest importance. The fleeces of British sheep are of coarse and of medium wool; the fine wools used by English spinners are imported. The home-grown wool averages about 25 per cent of that used in the great domestic woolen and worsted industries.

Although Great Britain has never developed a swine industry comparable to that of cattle and sheep raising, Ireland and parts of England have been famed for the excellence of their pork products.

The animal industries of Britain yield a considerable revenue also through the exportation of breeding stock. Economic as well as geographic conditions have for two centuries encouraged careful selection and improvement of livestock. Of the breeds of beef cattle which have found favor in the New World, Britain has produced five or six and the continent of Europe none; of dairy cattle, Britain five or six and the continent two or three; of sheep, Britain ten or more and the continent only two; and of horses a number at least equal to that of the continent.

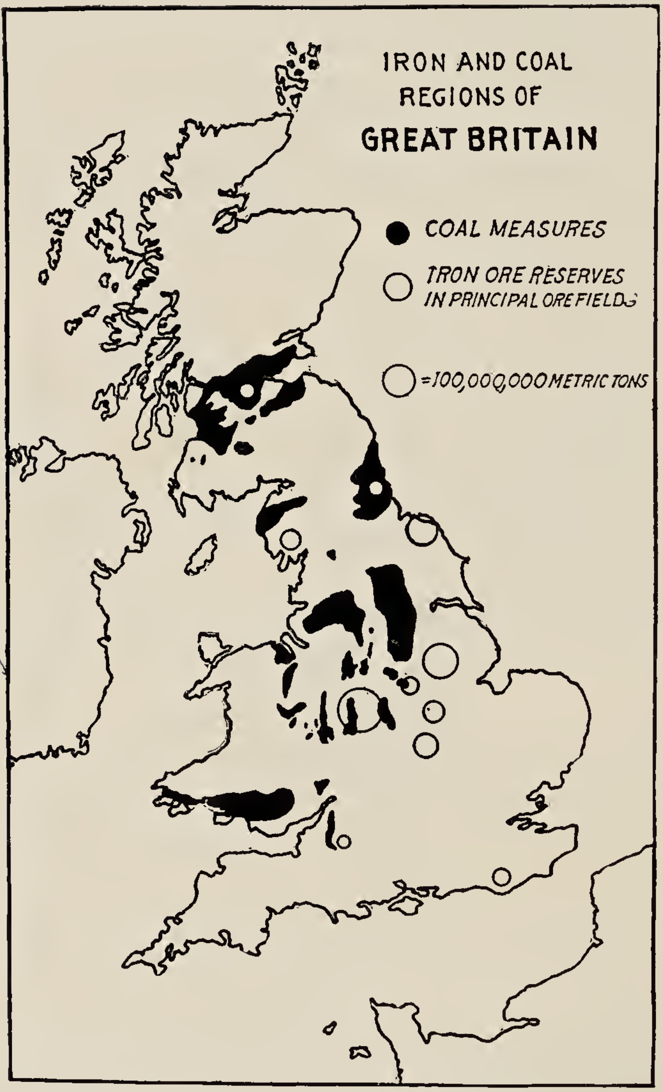
Perishable Foods Produced at Home.—Since food must be imported to supply the great industrial population it is desirable to import from a distance those things which can best stand the delays and the costs of transportation. Thus wheat is much more largely imported than the bulky and perishable meat. Milk is, however, more bulky and more perishable than meat and almost all of it is produced at home. Formerly butter and cheese were important products of the British dairies; now nearly three-fourths of the milk is consumed fresh. It is carried to the great population centers by fast milk trains, while butter and cheese are imported from Ireland, the continent, and the colonies.

For this same reason the main crop of fruits and vegetables is raised at home. The mild, moist climate is also very favorable to vegetable production, including potatoes. Market gardening is common near the great cities, while in the milder climates of Cornwall and the south of Ireland, early vegetable growing is of some importance. County Kent, in the extreme southeast, close to the London market, is the most important fruit-growing district of the country.

MINERAL RESOURCES

The Significance of Coal.—Coal is stored-up power; a pound of it yields as much energy as a laborer uses in a day's work; and Great Britain, with 54 per cent of the coal of Europe, is one of the most richly endowed countries (Fig. 205). This little island produces more coal than any other country except the United States, and its reserves are estimated at more than 200 billion tons—enough to last 700 or 800 years at the present rate of mining. No other factor in the geography of the British Isles has directed the course of economic development so greatly as this factor of abundant coal (Fig. 206). Its energy drives the machines in the British mills and factories, and the majority of British ships; moreover, British coal supplies return cargoes to many ships that bring foodstuffs and raw materials to maintain the life of the British nation. Great Britain is the most distinctive industrial and commercial country in the world. The whole vast empire has been acquired and is maintained primarily for the benefit of the industries and commerce of the home country. The British Isles have relatively limited resources of soil, timber, metals, and most other materials, and the population and industries would starve in a few months if supplies from the outside were cut off. But Britain is rich in human ability and in mechanical energy—

in labor, in ability, and in coal. Her problem is to market this surplus of human ability and mechanical energy. The mechanical energy of her coal cannot be adequately marketed in that form, but it can be marketed in the form of manufactured cottons and woolens, machinery and ships, and hundreds of other manufactured articles. It is a fundamental principle of trade that countries shall exchange what they have in surplus for what they lack. Since the only salable native material that Britain has in great abundance is coal or its energy, this is and must be in some form the basis of its international exchange. When the Australian buys English cottons or machinery he is buying a compound made of foreign raw material, British coal, and British labor, capital, and brains; and the goods are brought to him in British ships whose earnings flow back to British owners.


IRON AND COAL REGIONS OF GREAT BRITAIN
● COAL MEASURES
○ IRON ORE RESERVES IN PRINCIPAL ORE FIELDS
○ =100,000,000 METRIC TONS

Study Page 24 of Atlas
Notice similarity of
coal & population

FIG. 205.—Great Britain produces much more coal than her own requirements, but imports about half of the iron that her industries use.

In the British Isles there are upwards of 20 different coal fields of varying degrees of importance; 5 of these produce the greater part of the coal (Fig. 205):

1. The Clyde field, surrounding Glasgow, in Scotland.
2. The Northumberland-Durham field, surrounding Newcastle.
3. The Yorkshire-Derbyshire field, surrounding Leeds and Sheffield.
4. The Lancashire field, near Liverpool and Manchester.
5. The South Wales field, with Cardiff as its sea outlet.

The coal varies in quality, but includes some of the best in Europe. None of it is equal to Pennsylvania anthracite, though some is superior to any of the American bituminous coals. The best Welsh coals are nearly smokeless and are the favorite coals for steamship use. It will be seen from Fig. 205 that several of the coal fields are on the seacoast, and mines in these fields deliver coal cheaply into seagoing vessels, a condition which gives Great Britain an advantage over most other countries in the exportation of coal.

Several of the iron ore regions are in or near the coal fields, and this has made economies possible in the smelting of these ores. In the decade following the World War, important changes occurred which cut down the use and sale of British coal and restricted the iron and steel industries.

Iron Ore Resources.—For many centuries England has been a large producer of iron ore. Charcoal made from the wood of the forests was the first smelting fuel, and the early iron works were placed near the ore and in the forests that supplied the charcoal. Iron ores of varying qualities are widely distributed in England, and to a minor degree in Scotland, Wales, and Ireland. Ore sufficient for about 40 per cent of the country's needs is still obtained within the islands, most largely in the Cleveland district in the northeast of England and in Furness, in the northwest (Fig. 205). It is mined in small quantities in at least 50 different places in Great Britain. A further advantage is the presence of abundant limestone suitable for a flux in the smelting process. This nearness of iron to the coal, to limestone, and to the sea was an important advantage in the days of poor land transportation and aided materially in the upbuilding of the British iron and steel industries. For over 40 years the production of iron ore in Great Britain has fallen off slowly, while the imports, especially from Spain, have risen. In recent years the production of pig iron and of steel in the British Isles has not kept pace with the increase in the United States.

Tin, Copper, Lead, and Zinc.—The tin mines of Cornwall in the extreme southwest of England have been worked since the twelfth century and possibly much longer. For 5 or 6 centuries they were the world's chief source of this metal, but the production is now small and England is mainly an importer of tin. Copper, lead, and zinc are all mined in the British Isles, but in quantities that have declined to small proportions, and they supply only a trifling fraction of the nation's needs. Of the various metals mined in the United Kingdom iron alone is of any present significance (Fig. 206).

Minor Non-metallic Minerals.—The most valuable of these minerals are (1) limestone, (2) building stones, (3) clay, (4) oil shale, and (5) salt, but none of these reaches any large annual value, and their total value ordinarily does not exceed 30 million dollars a year. The china clays are the basis of a large pottery industry, and English clays are imported into the United States for use in the potteries of Trenton and elsewhere. The only extensive production of petroleum by the distillation of oil shale anywhere in the world is in Scotland. The products obtained in this way are more expensive than similar products obtained in the usual way from oil wells, and are wholly insufficient for British needs.

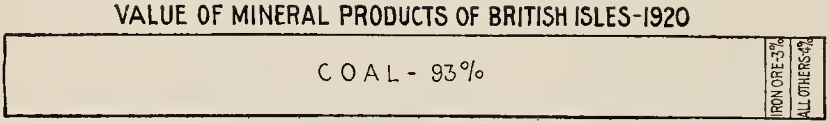


Fig. 206.—The relative importance of coal among British mineral products is impressively shown in this figure.

The Development of Manufacturing

The Influence of Early Inventions.—In the growth of a nation's industries many other influences interact with geographical influences. England's leadership in the textile industries is in no small measure due to four inventions which were made in that country in the latter part of the eighteenth century. These included the steam engine and power-driven machinery for spinning and weaving. Gradually these rapidly working machines replaced laborious hand methods, and England passed through the Industrial Revolution earlier than her rivals. This fact, coupled with her water power and her coal, her climate, her insular position, and the qualities of her people gave England a leadership in manufacturing which she still holds so far as Europe is concerned.

The Textile Industries.—The great development of British manufacturing and commerce gathers around the textile industries. The most characteristic product of the British soil for a thousand years has been wool, and for the last century the greatest import has been cotton. In no other country does the economic life rest so largely upon textile manufacturing and exportation. This industry began with woolen and linen before the invention of the cotton gin made cotton cheaper than wool. When cotton could be obtained cheaply from America the trained spinners and weavers of wool readily changed to the working of cotton. Cotton must be spun and woven in a damp atmosphere to prevent the snapping or "fuzzing" of the fine threads, and this climatic requirement is better met on the west (rainy) side of England than on the east. Moreover, the greater part of the cotton comes from America, and is most conveniently landed at the west coast ports. Water power and coal are available on the western side of the Pennine Chain, and altogether, the west of England is best suited to cotton manufacturing. Generally the woolen mills became concentrated on the east side of the Pennine Chain and cotton mills on the west side in Lancashire with Manchester as the center and Liverpool as the chief receiving port. The Manchester ship canal now permits ocean vessels to reach that city (Fig. 207). Between 35 and 40 per cent of the cotton spindles of the

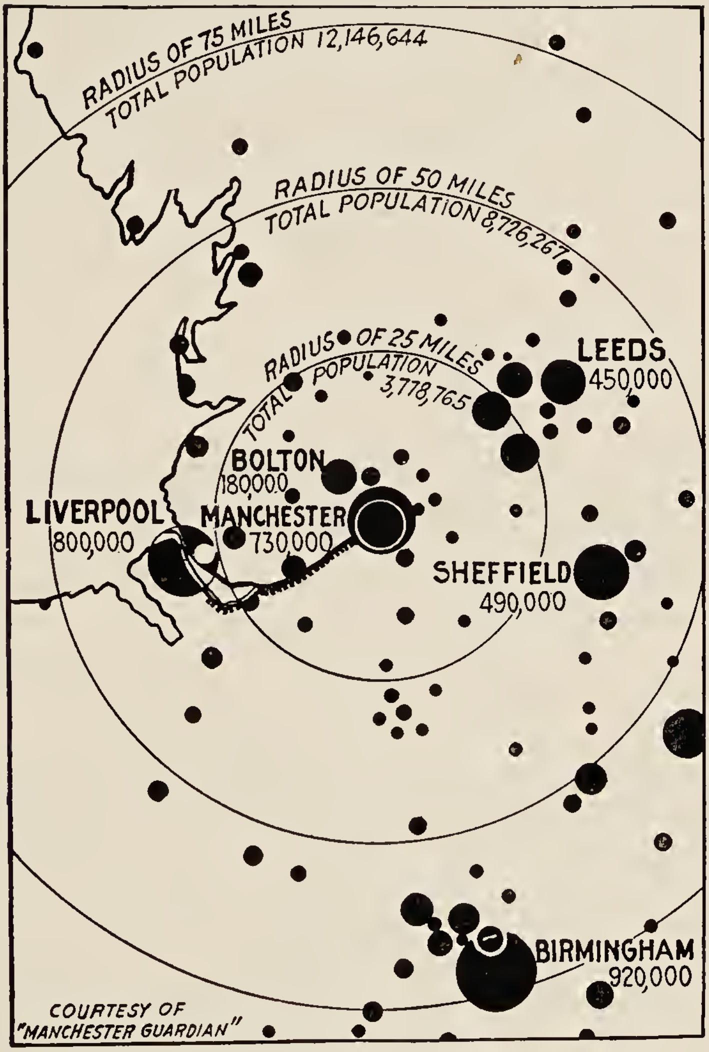

RADIUS OF 75 MILES
TOTAL POPULATION 12,146,644
RADIUS OF 50 MILES
TOTAL POPULATION 8,726,267
RADIUS OF 25 MILES
TOTAL POPULATION 3,778,765
LEEDS
450,000
BOLTON
180,000
LIVERPOOL
800,000
MANCHESTER
730,000
SHEFFIELD
490,000
BIRMINGHAM
920,000
COURTESY OF "MANCHESTER GUARDIAN"

Fig. 207.—The manufacturing region of west central England.

world are in this region, and many cities and towns are almost wholly devoted to cotton manufacturing. Some specialize in spinning, some in weaving, some in bleaching, and some in dyeing and printing. Since raw cotton must come by a long sea voyage, which adds to its cost, British mills find it to their advantage to make a large proportion of the finer and more expensive fabrics, leaving it to the countries with cheaper cotton, but less experience to manufacture the coarser goods. On the whole, the United States makes a higher proportion of the lower grades of cotton goods than does Great Britain.

Linen is still the characteristic textile of the north of Ireland, with Belfast as its center of manufacture. Only a minor part of the flax for this linen is grown in Ireland or in the British Isles; it comes from Russia, Belgium, and elsewhere. Silk manufacturing has never become important in the British Isles. The value of the textiles manufactured in the United Kingdom a century ago and at present may be represented approximately by the following figures:

	COTTON	LINEN	WOOLEN
A century ago	1	4	17
At present	120	25	55

About 5 million persons in the British Isles are supported by the earnings of the textile workers, and a third of the value of British exports is made up of textiles.

Iron and Steel Products.—In all the great manufacturing countries, textiles and steel products are usually the leaders for the world's demand for them is enormous. Britain's iron and steel manufactures have arisen from the great home and foreign demand for such manufactures, and her own resources of iron ore, limestone, and coal. There are important steel industries near each of the principal coal fields, but the chief concentration is in central England, in and around Sheffield and Birmingham, in the section known as the Black Country. More than half the iron ore used is imported; it comes most largely from the north of Spain, but also from Sweden. Many factors have combined in recent years to hinder the growth of the British steel industry: (1) the high cost of coal mining due to a bad labor situation, (2) the increased cost of native and imported ores, (3) the increasingly severe competition of other countries where steel can be made at lower cost. In 1850 the United Kingdom produced four times as much pig iron as the United States; in 1927 the United States produced five times as much as the United Kingdom.

Shipbuilding.—The insular character of Great Britain, her vast colonial empire, and her extensive ocean commerce combine to make a large demand for ships. There was (1) a demand for ships, (2) the materials for constructing them, and (3) a body of trained men competent to construct them; thus Great Britain became the greatest of shipbuilding nations—building for other countries as well as for herself. The Clyde

River in Scotland stands first in shipbuilding. This is followed by the Tyne, the Wear, the Tees, the Thames, and by Belfast in the north of Ireland. On the banks of the first four rivers named are built about 75 per cent of the total tonnage of the British shipyards. In normal times Great Britain builds about as many ships as all the rest of the world, and partly because of the great number constructed, British shipbuilders have been able to build them more cheaply than most other countries.

Miscellaneous Manufactures.—Like other industrial countries Great Britain manufactures leather and rubber goods, chemicals, pottery, glass, food products, machinery, vehicles, clothing, and the whole long list of industrial products. As a rule British goods are made on honor and have a high reputation for dependability, and British manufacturers turn out mainly standard, staple goods, for which there is a fairly steady demand—differing in this respect from France whose manufactures are more largely luxuries.

The Dependence of Great Britain on Manufacturing.—For reasons already given, Great Britain has reached the point where her national life depends upon manufacturing and commerce. Her people must buy imported food and must pay for it with their coal and their labor, embodied in their manufactures. Heretofore, the advantages of various kinds possessed by Great Britain have enabled her to import raw materials and convert them into manufactured goods and sell them at a profit in competition with other nations. But this competition is growing ever more keen, and some of the advantages possessed by the British at an earlier date have one by one disappeared.

THE COMMERCE OF THE UNITED KINGDOM

Two Aspects of British Export Trade.—The British recognize two aspects of their export trade: (1) the exportation of the products of British industries; and (2) the reexportation of imported products in substantially unchanged form. The former group includes the products of British soil, mines, forests, fisheries, and factories; the latter includes such articles as rubber, tin, wool, vegetable oils, and tea in the marketing of which the British act only as middlemen. Over five-sixths of the value

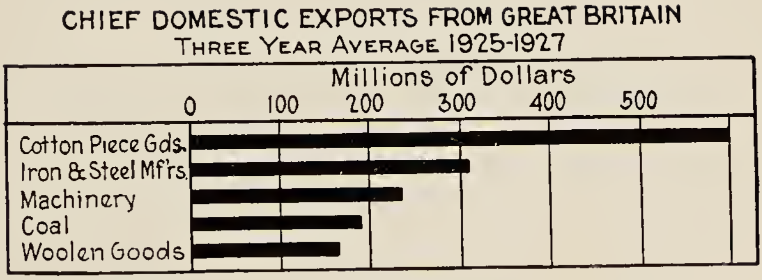


FIG. 208.

of British exports belong to the former group and less than one-sixth to the latter.

The Principal Exports.—Manufactured goods overshadow everything else in British exports, making up 85 per cent or more of the total (reexports not included). The only important export outside of manufactures is coal. Among the exports cotton goods lead; yet if all forms of iron and steel, including machinery and vehicles, are grouped, they have a larger total value than cotton products (Fig. 208). Woolen goods rank third. These three groups—goods made of iron and steel, of cotton, and of wool—make up about 75 per cent of the value of the exports of British manufactures. The remaining 25 per cent of exported manufactures consist of an endless variety of goods—leather and rubber goods, paper, glass, pottery, apparel, chemicals, oils, etc.

The principal imports are, of course, largely included in the two groups, (1) foodstuffs, and (2) raw materials for manufacturing. Each of these comprises from 30 to 40 per cent of the total imports, while manufactured goods make up about 25 per cent. Raw cotton is usually the largest import,[1] followed by wheat and flour, meats, dairy products, wool, sugar, lumber and timber, and rubber (Fig. 209).

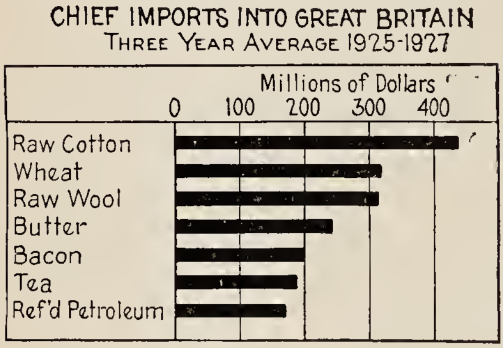


Fig. 209.

The British Entrepôt Trade.—The word "*entrepôt*" is applied to a commercial city that is extensively engaged in collecting products from various parts of the world and in reexporting them to other parts. During the past thousand years, 6 different cities have, in successive periods, held the place of the principal entrepôt of Europe—Venice, Lisbon, Bruges, Antwerp, Amsterdam, and London. The last named city rose to its commanding position along with the rise of British commerce and the British command of the sea routes of the world. It is natural that a country with many productive colonies should collect the colonial products, bring them to a home port, and thence redistribute a portion of them to other parts of the world. The same merchants and ships that engage in this colonial trade may, with little additional effort, collect products from places near the colonies, and redistribute these also. Thus, a world-wide entrepôt trade is built up by some favorably situated port in a commercial country; the outstanding entrepôt of today is London, though its control of this trade was weakened by the World War. Prior to 1914 the United States bought great quantities of rubber, tin, wool, furs, and skins through London, and still does so, though there are evidences that this trade through London was considerably broken up by the war. The greater part of Britain's reexports are products from the Far East or from Africa. They include wool—mainly from Australia and South Africa; rubber and tin from the Malay region; skins from Asia and Africa; cotton from Egypt; tea from the Orient; and vegetable oils from Asia and Africa. A major part of these commodities come from British colonies.

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[1] This was not true in 1921.

Correcting the Adverse Balance of Trade.—British imports exceed exports by a huge sum, a sum that runs into hundreds of millions and even billions of dollars annually. Since the British people annually pay out vastly more for goods purchased abroad than they receive for the goods they sell abroad, a large yearly deficit results from these transactions, and if this deficit continued to pile up, the nation must become bankrupt. Yet, in spite of its continuous adverse balance of trade, Great Britain has accumulated wealth rapidly and, next to the United States, is the wealthiest of nations. This comes about as follows:

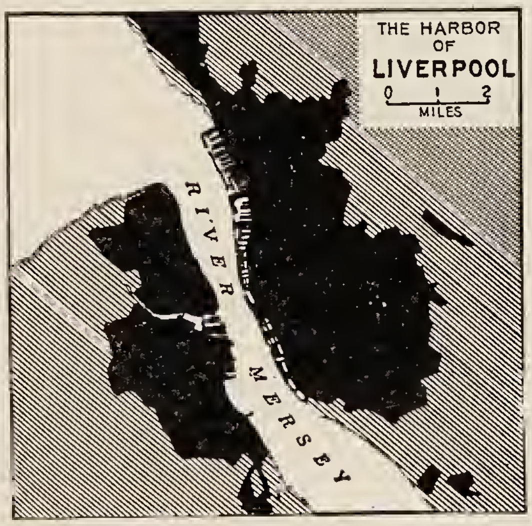

Fig. 210.—Showing some of the many docks by means of which Liverpool protects its shipping from tidal range.

1. British ships carry a great deal of the commerce of other countries and thus earn large sums annually.
2. A great many tourists visit the British Isles and spend large sums of money.
3. British investors are large owners of the securities (stocks and bonds) of foreign governments and foreign corporations, the dividends and interest from which flow back to the United Kingdom.

There are other sources of income, but these are the main ones and in normal times these so-called "invisible exports" not only offset the adverse balance of trade, but yield a surplus besides. Prior to the World War Great Britain was the foremost of the creditor nations, but changes wrought by the war have somewhat modified this situation.

The Principal British Ports.—The two outstanding British ports are (1) *London* and (2) *Liverpool* (Fig. 210). London is preeminently the port for trade with the continent of Europe, and Liverpool for the trade with America. Both share in the trade with Asia and Africa, but the entrepôt trade centers mainly in London. The London wharves extend for miles up and down the Thames, and those of Liverpool extend for an almost equal distance along the estuary of the Mersey. (3) *Hull* has about one-fifth of the commerce (in value) of London or Liverpool; it is situated on the estuary of the Humber and is the eastern seagate for the great manufacturing district of north central England. (4) *Manchester*, center of the cotton manufacturing district of Lancashire, is connected with Liverpool by a ship canal 35 miles long (Fig. 207). (5) *Glasgow* is in the coal fields and manufacturing district of southern Scotland, and on the Clyde, the chief shipbuilding river of the world. (6) *Bristol*, on the Avon, a short distance up from Bristol Channel, is one of the ports engaged in trade with America. (7) *Newcastle* is the great coal shipping port of northeast England. (8) *Cardiff*, in southern Wales, is the greatest of all coal shipping ports. (9) *Southampton* is an important passenger and mail port in the south of England. (10) *Leith*, in the east of Scotland, or *Grimsby*, in the east of England, usually ranks tenth among the British ports.

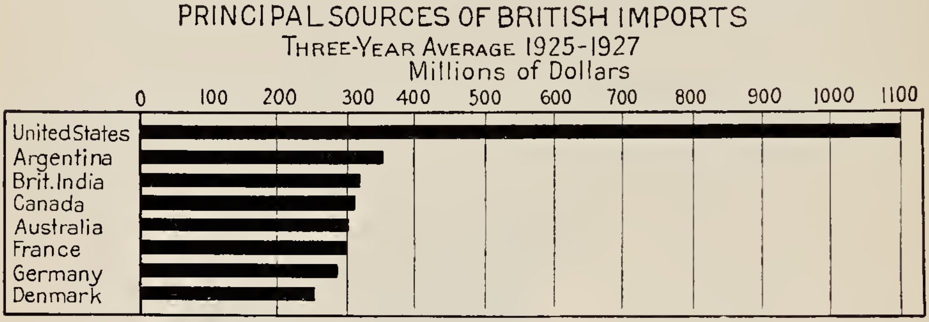

FIG. 211.

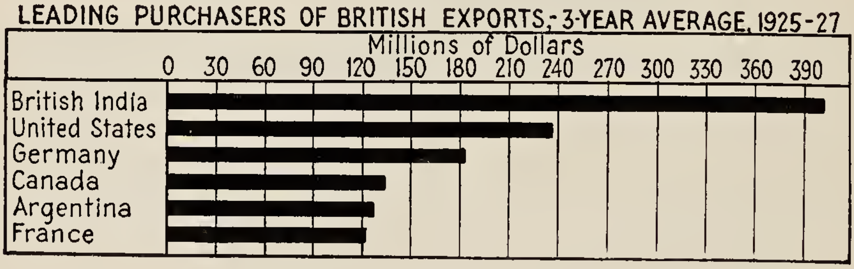

FIG. 212.

Countries with Which British Commerce Is Most Largely Carried On. The British have long been in the forefront of trading peoples. Their colonial empire, merchant fleet, long experience, and reputation for fair dealing enabled them to hold a goodly share of the trade of nearly all countries. Yet Britain's trade with six countries is about equal to that with all the rest of the world. The following table brings out this point (Fig. 212):

(U. S. Commerce Yearbook, 1928, Average for 1925, 1926, 1927)

British Imports from		British Exports to	
United States	$1,090,000,000	British India	$ 409,000,000
Argentina	350,000,000	United States	237,000,000
British India	320,000,000	Germany	182,000,000
Canada	307,000,000	Canada	135,000,000
France	300,000,000	Argentina	128,000,000
Australia	300,000,000	France	121,000,000
	$2,667,000,000		$1,212,000,000
All countries	$6,112,000,000	All countries	$3,451,000,000

Total British trade $9,563,000,000
Trade with six countries .... $4,223,000,000 = 44 per cent

It is rather striking that only two European countries, France and Germany, appear in the above table. A second impressive fact is that the United States sells more goods to Great Britain than do the three principal British dependencies combined. Yet as a buyer of British goods the United States holds second place, and British India first place.

Nearly 40 per cent of all British imports come from five great producers of raw materials and foodstuffs—the United States, Argentina, Australia, Canada, and British India, three of which are British colonies; yet British trade with the colonies forms only about one-third of the total British trade.

Following the group of big agricultural countries shown in the first column of the table, comes a group of three of the smallest European countries—Denmark, Netherlands, and Belgium—all of which export goods of surprisingly large value to Great Britain. This may be explained by the nearness of these countries and the great demand in England for their products and those of their colonies.

The Extent of the British Empire.—The present widely extended British Empire has grown by colonization and conquest. Australia, New Zealand, parts of Africa, and many islands were taken from the weak native peoples who possessed them. Canada was taken from France as the result of the wars of the eighteenth century. India was gradually absorbed into the empire through commercial penetration and conquest. The Union of South Africa and the German colonies in Africa were acquired mainly through war. Besides these large territories, Great Britain has gradually come into possession of many of the most strategic points on the trade routes of the world (Fig. 213). Gibraltar, Malta, the Suez Canal, Aden, Ceylon, the Malay Peninsula, and Hongkong form an unbroken chain for 10,000 miles from England to the Far East by the Mediterranean-Suez route. British South Africa guards the Cape of Good Hope route. The Falkland Islands lie on the route around Cape Horn. Jamaica and other West India Islands guard the Panama route. Nova Scotia offers a naval base on the Atlantic side of North America and British Columbia on the Pacific side, and almost numberless islands under the British flag dot the Pacific and Indian Oceans. On any of

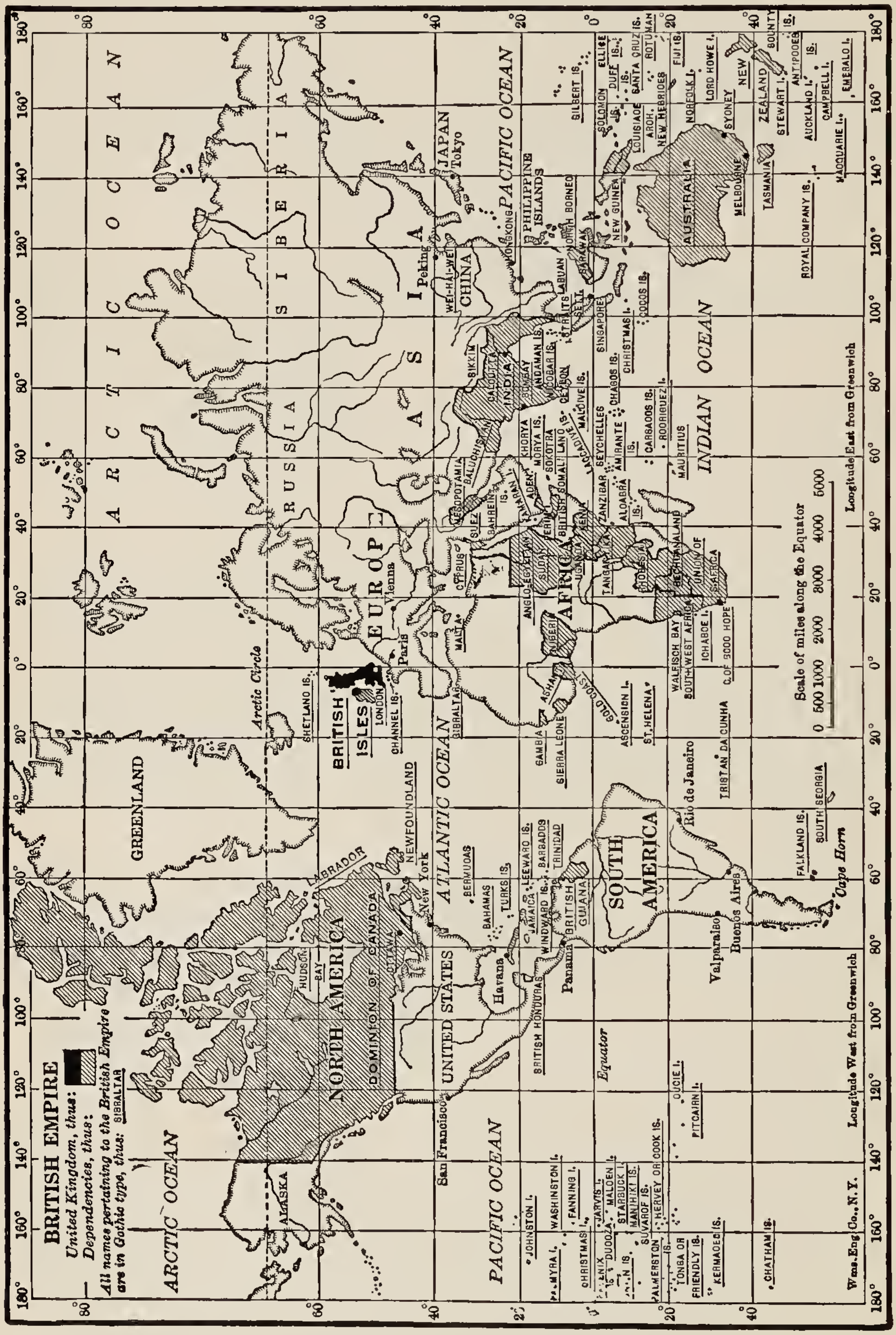
BRITISH EMPIRE
United Kingdom, thus:
Dependencies, thus:
All names pertaining to the British Empire are in Gothic type, thus: GIBRALTAR
ARCTIC OCEAN
GREENLAND
ALASKA
NORTH AMERICA
DOMINION OF CANADA
UNITED STATES
PACIFIC OCEAN
ATLANTIC OCEAN
SOUTH AMERICA
BRITISH ISLES
EUROPE
RUSSIA
SIBERIA
ASIA
CHINA
JAPAN
INDIA
AFRICA
AUSTRALIA
INDIAN OCEAN
NEW ZEALAND
Arctic Circle
Equator
Scale of miles along the Equator
0 500 1000 2000 3000 4000 5000
Longitude West from Greenwich
Longitude East from Greenwich
Wm.Eng.Co.,N.Y.

FIG. 213.—The British Empire; four times the land area and four times the population of the United States. (*Courtesy Macmillan Co.*)

the great routes of trade, a British ship is seldom far from a British port. Of the 25 or 30 greatest ocean ports of the world about one-half are in the British Empire (British Commonwealth of Nations).

The interaction of Geographical and Other Influences in the Upbuilding of the British Empire.—It has already been pointed out that Great Britain is a nation that lives primarily by: (1) importing raw materials; (2) manufacturing these into finished products; (3) selling the finished products at a profit; (4) employing its fleet in carrying British and other commerce; (5) investing its profits or a part of them in productive enterprises in many parts of the world; and (6) conducting an extensive entrepôt trade.

n.

Conclusion.—It is estimated that by their commercial and financial operations, the British people derive an annual net profit of at least a billion dollars a year, and possibly very much more than that. Due credit must be given to the genius of the British people for this achievement, for a less gifted people could not have accomplished such results even in the same environment and with the same natural resources. Neither could the British people have accomplished them without the tremendous reservoir of mechanical energy found in their coal beds, for upon this great resource the manufacturing industries are built.

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France - Med. type
of climate with hot
dry summers
and warm moist
winters

N.W. part
Conditions
same as
the Br. Isles

CHAPTER XXV

FRANCE AND BELGIUM

FRANCE

Advantages of Geographical Situation. *Climatic.*—Northern and western France are under the oceanic influences that prevail in the British Isles. Snow rarely falls in Paris; and Brest, on the northwestern coast, has an average January temperature 44 degrees warmer than Devils Lake, N. D., in the same latitude. Over most of lowland France, except in the south, summers and winters are mild and rain falls frequently but not heavily. The conditions for agriculture and stock raising are excellent. The extreme south has the Mediterranean type of climate, with hot, dry summers and warm, moist winters; this is the "Sunny France" of tradition.

Commercial.—All things considered, France has an unequaled location for world trade. Its northern ports are on the English Channel, one of the world's greatest commercial thoroughfares. Brest, Nantes, St. Nazaire, and Bordeaux, on the west coast, are nearer the Americas and Africa than are most British ports; and southern France is several days closer to the Near East and to the Far East by Suez than are the North Sea countries. France is the only country (if Russia be excepted) that faces on both the northern and the southern ocean-ways of Europe. Besides its advantages of location for ocean commerce, it has a good situation for overland trade.

Military.—With the exception of the Belgian frontier and a short stretch where it touches Germany, France everywhere is set off by natural boundaries—mountains, the sea, or the Rhine. The Pyrenees form a nearly impassable military barrier on the frontier of Spain; the Alps rise between France and Italy and also between France and Switzerland; and a low but rugged mountain belt extends from southern Belgium through Luxemburg into Lorraine and Alsace, the latter being separated from Germany by the Rhine. Only through Belgium does nature offer an unobstructed route from Germany, and it was by this route that the German army struck France in 1914.

FRENCH AGRICULTURE

The Use and Ownership of the Land.—The physiographic and climatic features of France have divided the country into several agricultural regions. These may be arranged in groups which include (1) the well-watered northern and western lowlands, (2) the highlands of Brittany and central France with their poor granitic soils, (3) the rugged lands of the Alps and the Pyrenees, and (4) the Rhone Valley and the southern coast lands with the dry summers of the Mediterranean climate. Over one-half of France is lowland of more than average fertility; 45 per cent is under cultivation, and a fifth is devoted to pasturage (Fig. 214). France has more farm land of excellent quality than any other European country except Russia. Over 40 per cent of the population is engaged in farming, as against 6 per cent in the United Kingdom. Moreover, the greater part of the farms are tilled by their owners, a highly desirable condition, but not one which prevails generally throughout Europe. The farms, which average 20 to 40 acres in size, are industriously but not scientifically cultivated. As a rule the farmers live in villages and not upon their farms. Due to an unfortunate system of inheritance a 30-acre farm may be made up of several small plats of ground almost entirely unfenced, marked only by corner stones and separated from one another by considerable distances. The land of France is naturally more productive than that of Germany, but the farming is so much less scientifically done that crop yields have generally been lower.

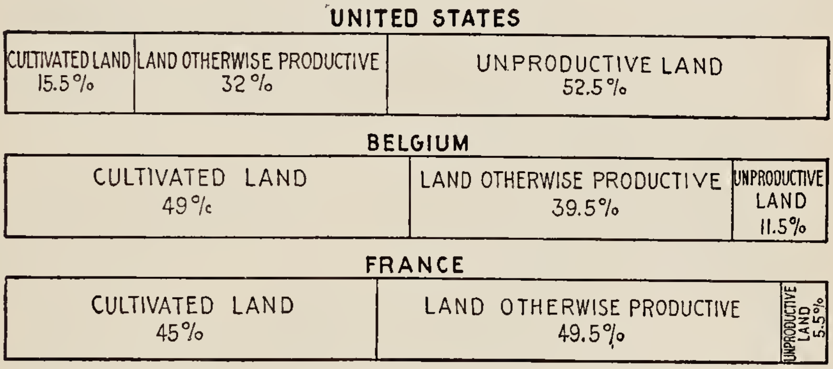

Fig. 214.—Comparative utilization of land in the United States, Belgium and France.

Cereals.—Like the English and the Americans the French use white bread. Wide stretches of level land and the mild west-European climate, coupled with a high protective tariff, have brought France nearly to self-support in cereals and give the country a rank second only to Russia in wheat production in Europe (Fig. 197). About one-fifth of the cultivated land is devoted to wheat and about half of the crop is raised in the Paris basin. Oats, the other important cereal, are grown mainly in the cooler northern half of the country. Corn (maize) is grown only in the warm moist southwest, while rye is found mainly in the bleaker climates and poorer soils of Brittany and the Auvergne (Figs. 276 and 283).

The Grape and Wine Industry.—France is the leading wine producer of the world. The modified Mediterranean character of the climate of much of the country is ideally suited to the growing of wine grapes. Vine culture is commonly practiced on the well-drained river bluffs and hill slopes where centuries of intensive tillage have greatly modified the soil. The principal vineyard districts are shown in Figure 215. Each district produces its own brands of wine, some of which have become known throughout the world. The lighter wines are made in the west and south, and the stronger wines in the east. On the slopes of the chalk escarpments of the eastern Paris basin, where vineyard lands command as high as $3,000 an acre, a limited amount of the famous and expensive Champagne is produced. The total quantity of wine used in France is almost past belief, averaging in the past upwards of 1 billion gallons a year. Since more wine is imported than is exported by the French, it follows that on an average each person in France must consume a barrel of wine yearly.

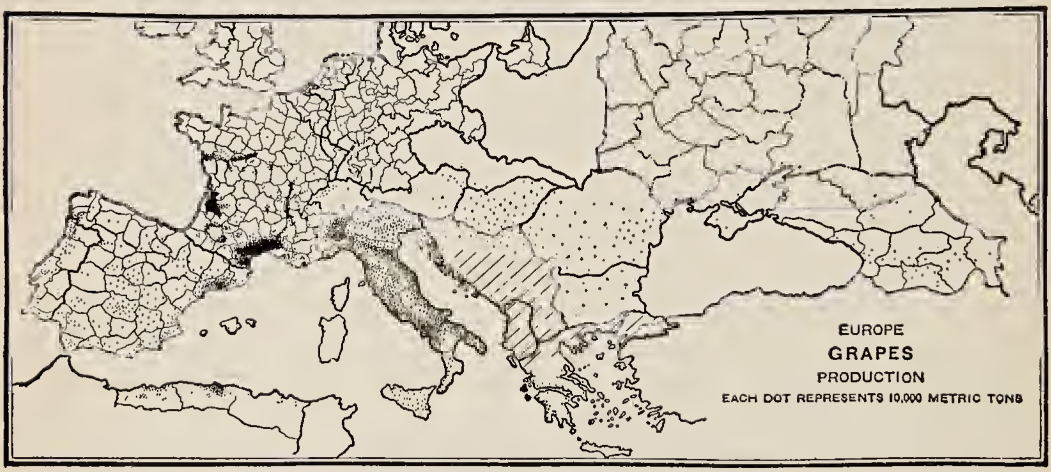

Fig. 215.—The Mediterranean countries are the leading wine producers of the world. (*U. S. Dept. Agr.*)

In the north, beyond the limit of the vine, 400 million gallons of cider are made and used annually. It is at least an interesting speculation and by no means an impossibility that the abundant use of the light alcoholic beverages and the use of beer in northern Europe, like the use of tea in the Orient, may be in part in avoidance of bacterial infection in drinking water. The use of deep drilled wells is comparatively recent. In many of these old lands the chief sources of water are shallow wells, springs, and streams, all of which draw upon surface waters which not uncommonly swarm with the bacteria of infectious diseases. The high quality of the best French wines is due not alone to climate and soil, but equally to the care with which the wines are prepared. Generations of experience and a large amount of capital are invested in expensive appliances which are essential to the production of the uniformly superior article which commands a high price in foreign markets. However, much of the wine consumed by the common people of France is inferior.

Sugar Beets and the Sugar Industry.—During the Napoleonic Wars, France was at times cut off from her accustomed supplies of cane sugar from the tropics. The government thereupon offered a bounty for the production of sugar from the beet, which was being used for this purpose in a small way in Germany. The industry thus obtained a start. The great improvement of the beet as a source of sugar is mainly due to German scientists during the past century. By 1914, central Europe, from France to Russia, had become a producer of sugar to the extent of nearly half the world's supply (Fig. 233).

The principal sugar beet lands of France are in the extreme northeast near the Belgian border, where Belgian labor is available during parts of the year, for sugar beets require a great deal of hand labor. Before the World War, France was more than self-sufficing in sugar, but the industry, which was nearly ruined by the German invasion, only slowly recovered after 1918. Of the 213 sugar mills in operation in 1913, only 61 were operating under French control when the war was ended.

Vegetables and Truck Farming.—Potatoes are less important in France than in Germany (Fig. 232), but the quantity produced is practically equal to that grown in the United States which has a total area 14 times as large. The per capita production in France is nearly 3 times as great as that in the United States.

The vegetable crop of France furnishes an important part of the food supply of the people and also of their livestock. Potatoes, cabbages, and root crops, particularly in western France, are used in feeding cattle. In southern France and in the warmer parts of the western coast are well-established horticultural industries. In the south, flowers are raised for the northern markets and for the manufacture of perfumes. On the coast of Brittany several localities have developed extensive truck farming industries because of early seasons and close proximity of the great industrial markets of England, France, and Germany. The earliest of all French vegetables are grown on the coast of Algeria.

The Animal Industry and Dairy Products.—Agriculturally, France is a well-balanced country; it raises cereals, vegetables, fruits, and livestock but specializes in none. With the exception of grapes it does not rank first among European countries in any product of the land. The north of France is the most important horse-raising region of the country. This is the home of the Percheron draft horse. Nearby, on this same well-watered lowland in Belgium and England are the homes of similar breeds of nearly equal renown.

In most parts of France the cattle are not sharply distinguished as to purpose but are used for beasts of burden, for milk, and for meat. There are more breeds of cattle in France than in England yet none of them has been developed to a point of superior excellence for either meat or milk production. Cattle are least abundant on the dry Mediterranean coast. They are most abundant in the moist northwestern coastal region and in Brittany and the Auvergne where humid climate or rough topography discourage tillage and encourage grazing (Fig. 198). Dairying is an important aspect of the industry in each of these regions and also in the French Alps. France is an exporter of both butter and cheese and some of her cheeses have attained a wide reputation. These include the Camembert and Brie of the north and the Roquefort of southern France. Roquefort cheese is made from sheep's milk and is ripened in caverns underground. Its manufacture furnishes a livelihood to upwards of 50,000 people and yields 20 million pounds of cheese annually.

Sheep are most numerous in the drier southern half of France and upon the chalk hills of the Paris basin which are similar to the English "Downs." The high development of woolen manufacturing in France is closely connected with the domestic sheep industry, though the present number of sheep is less than half the number in the United Kingdom, and imports of wool are several times greater than the home production. Due to their ability to use waste products from house and garden, swine, poultry, and hares are particulary important in the domestic economy of the French.

THE MINERAL RESOURCES AND INDUSTRIES

Largest Iron Ore Resources in Europe.—In one resource France leads all Europe: The iron ore reserves of Lorraine[1] nearly equal in quantity those of all the rest of Europe, and give to France a practically unlimited supply of that metal (Fig. 200). The ore bodies are of sedimentary origin; they are partly on the French side and partly on the German side of the boundary as it existed from 1871 to 1918 (Fig. 216). One of the reasons for Germany's tremendous industrial growth was the possession of the iron ore deposits taken from France in 1871 and developed by efficient German methods. These "minette" ores are not high in metallic iron (average, 30 to 40 per cent), and they contain so much phosphorous that some of them could not be economically used for making steel until the discovery of the Thomas process (about 1880). The quantity of ore, however, is enormous and with the return of Alsace-Lorraine to France, Germany lost over two-thirds of her iron ore, and France came into possession of these reserves and of the furnaces and steel mills that the Germans had built. Besides these major ore bodies in Lorraine, France has iron ores elsewhere, including those of Normandy and Brittany in the north and those of the eastern Pyrenees in the south (Fig. 217). However, upwards of 90 per cent of the ore mined in France and 75 per cent of that mined in Germany just before the World War came from the minette ores of Lorraine. Germany had also the necessary coal for smelting the iron ore, but France had not and does not now have, even

[1] Estimated at 5 billion tons.

with the Saar coal basin which was taken from Germany. The present situation is a handicap to both countries—one has a surplus of coal and a deficiency of iron ore, and the other has a surplus of iron ore and a deficiency of coal. With her coal and iron so largely in the northern and eastern part of the country the French steel industries naturally center in that part (Fig. 218).

Germ

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The Coal Resources.—France is poor in coal, having less than one-tenth as much as the United States and less even than Czechoslovakia. The chief coal field is in the extreme northeast, extending across the boundary into Belgium, and minor coal fields are located in various other parts of the country (Fig. 218). As a whole, the coal of France is of moderate quality and is expensive to mine, and hence is more costly to the users than is British, German, or American coal. Since the World War, France imports a third as much coal as her mines produce. By the peace terms the coal of the Saar basin (Fig. 216) was ceded to France, and this will be of material aid to French industries; but this coal is not of high quality, and makes only inferior coke. Undoubtedly the slower progress in manufacturing achieved by France as compared with the United States, Great Britain, and Germany is partly due to her inadequate coal resources.

of inferior quality

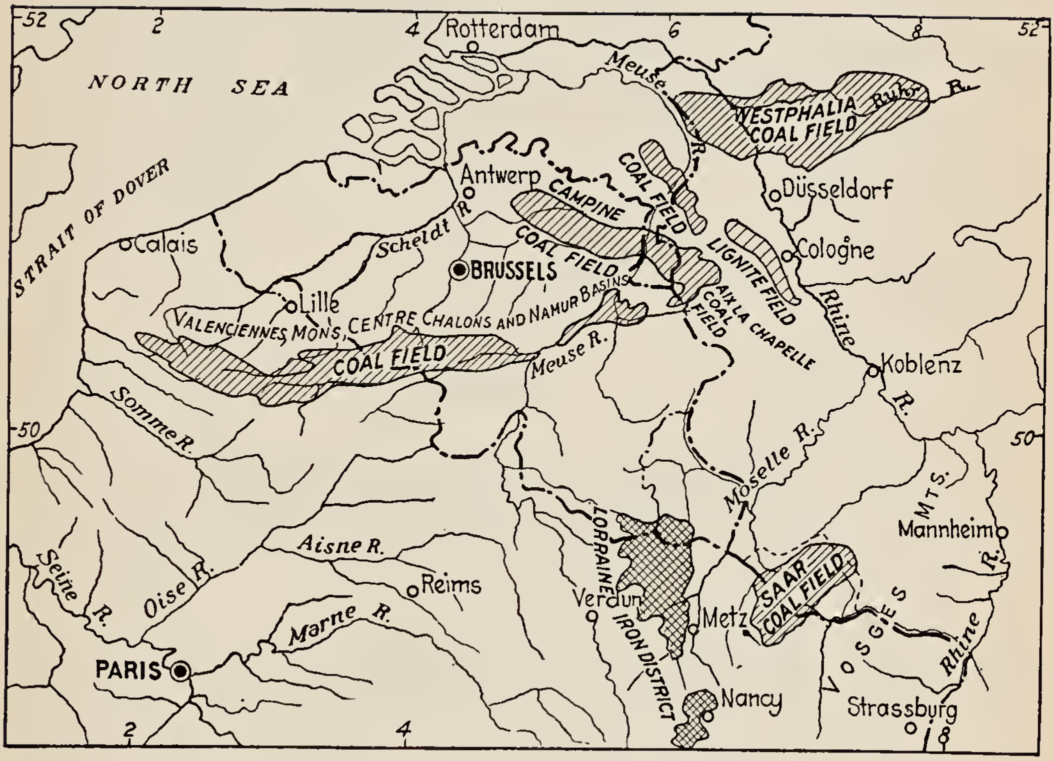
52
2
4
6
8
52
NORTH SEA
Rotterdam
Meuse
WESTPHALIA COAL FIELD
Ruhr R.
R.
Antwerp
CAMPINE COAL FIELD
Düsseldorf
STRAIT OF DOVER
Calais
Scheldt R.
BRUSSELS
LIGNITE FIELD
Cologne
Lille
VALENCIENNES MONS, CENTRE CHALONS AND NAMUR BASINS
AIX LA CHAPELLE COAL FIELD
Rhine
COAL FIELD
Meuse R.
Koblenz
R.
Somme R.
50
Moselle R.
50
MTS.
LORRAINE IRON DISTRICT
Mannheim
R.
Aisne R.
Reims
Seine R.
Oise R.
Verdun
Metz
SAAR COAL FIELD
VOSGES
Marne R.
Rhine
PARIS
Nancy
Strassburg
2
4
8

FIG. 216.—The most important coal and iron region of Europe, occupying parts of France, Belgium and Germany. (*U. S. Geol. Surv.*)

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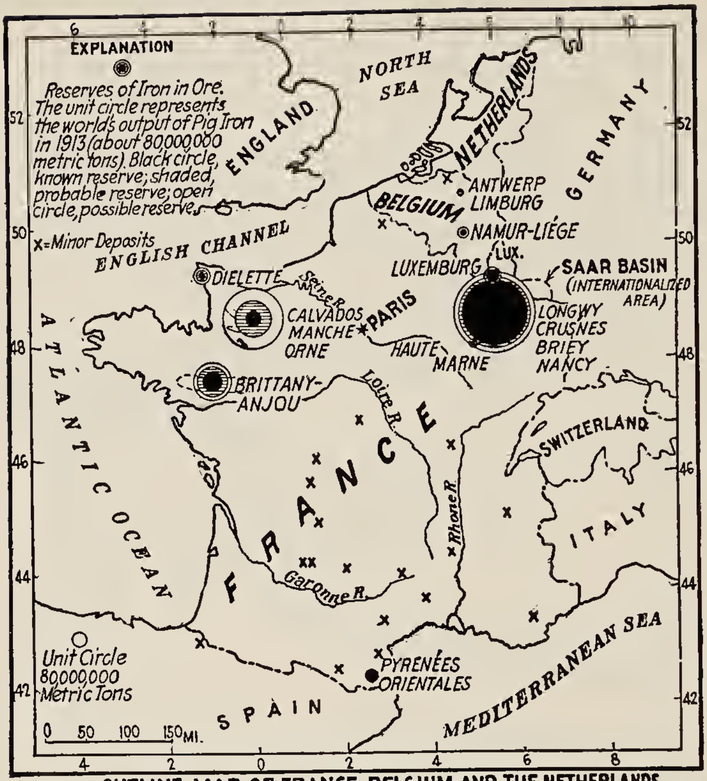
Shortage of Other Minerals.—France is poor in nearly all metals excepting iron, aluminum, and antimony, and the latter two are of


EXPLANATION
Reserves of Iron in Ore. The unit circle represents the world's output of Pig Iron in 1913 (about 80,000,000 metric tons). Black circle, known reserve; shaded, probable reserve; open circle, possible reserve.
x=Minor Deposits
NORTH SEA
ENGLAND
NETHERLANDS
GERMANY
BELGIUM
ANTWERP
LIMBURG
NAMUR-LIÉGE
LUX.
LUXEMBURG
SAAR BASIN (INTERNATIONALIZED AREA)
ENGLISH CHANNEL
DIELETTE
Seine R.
CALVADOS MANCHE ORNE
PARIS
HAUTE MARNE
LONGWY CRUSNES BRIEY NANCY
BRITTANY-ANJOU
Loire R.
FRANCE
SWITZERLAND
ATLANTIC OCEAN
Rhone R.
ITALY
Garonne R.
MEDITERRANEAN SEA
Unit Circle 80,000,000 Metric Tons
PYRENÉES ORIENTALES
SPAIN
0 50 100 150 MI.

OUTLINE MAP OF FRANCE, BELGIUM AND THE NETHERLANDS SHOWING RESERVES OF IRON IN ORE

FIG. 217.—France has the largest iron reserves of any European Country. (*U. S. Geol. Surv.*)

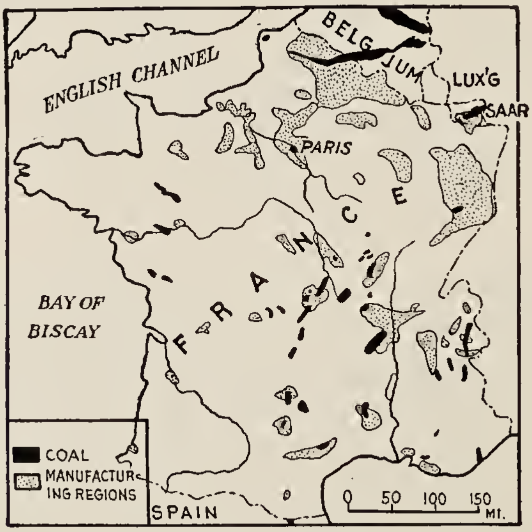

BELGIUM
LUX'G
SAAR
ENGLISH CHANNEL
PARIS
FRANCE
BAY OF BISCAY
COAL
MANUFACTURING REGIONS
SPAIN
0 50 100 150 MI.

FIG. 218.—The coal-producing areas and the industrial regions of France.

secondary importance. Copper, lead, zinc, gold, silver, tin, and nickel, are either wholly lacking or very scarce. France and the United States are the two largest producers of bauxite, the principal ore of aluminum. France is also one of the two leading producers of antimony, used in various alloys, including type metal. China clays of the finest quality exist, and are used in making the beautiful French pottery at Limoges and elsewhere. The reannexation of Alsace to France places that country in possession of an important source of potash. Formerly Germany had a monopoly of this salt, which is used mainly as a fertilizer; that monopoly is now broken; yet Germany has still the greater part of the world's known supply. A small amount of petroleum is also produced in Alsace.

The Development of Hydro-electric Power.—The enforced expansion of manufacturing into other parts of France during the four years of the World War when the Germans held the principal French coal field, led to a rapid development of hydro-electric power. France has great potential water power in the Pyrenees (Fig. 219), the Alps, the Vosges, and the Auvergne regions. The amount of such power in use more than doubled between 1913 and 1921, and France now has more such power in use than any other European country except Italy. This is one method by which France can make up for her shortage of coal.

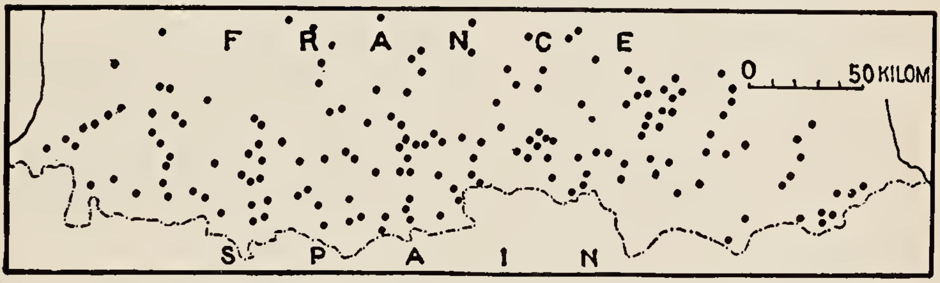


FIG. 219.—Each dot represents an installed water-power plant in the French Pyrenees or their foot hills in 1910. Many have been added since.

FRENCH MANUFACTURES

Character of the Manufactures.—Some of the causes underlying modern manufacturing are racial, some are economic, and some are geographical. The tone and temper of France is essentially artistic, pleasure-loving, and idealistic rather than industrial and commercial. The British, the Germans, and the Americans have found it easy to devote themselves to mines, factories, furnaces, and ships. Their coal and iron led them willingly into industrialism, for they are practical, materialistic peoples. The French temperament was less easily drawn toward industrialism, and coal and iron were less plentiful[1] in France. The Frenchman feels less the attraction of furnaces and factories. He loves money no less than others, but he cares less for the game of accumulating it in excess of his needs. On the other hand, the American and the German find pleasure in the very bigness of their enterprises. This is the age of big business and into it the Frenchman fits imperfectly. The French manufactures are characterized by richness of quality, elegance of design, and artistic finish. More than in most countries the artisans of France still find joy in the finished product of their handicraft. But France is conspicuously a manufacturer of expensive goods, of luxuries; and so when the periodical waves of business depression pass over the earth, the French exporter is the first to suffer. His more practical English or German competitor, making staple goods, suffers less.

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[1] The Lorraine iron ores were little appreciated until about 1880.

The Textile Industries.—For generations France was the unchallenged leader in silk manufacturing, an industry which grew up in the region around Lyon where in the earlier days silkworms were raised and raw silk was produced. It is still the greatest European center of silk manufacturing. Silk, of all the textiles, is the one in which the fine French taste and workmanship find their best expression. Very little of the raw silk is now grown in France, but Italy is nearby, and the high value of the raw silk permits bringing it from Japan and China.

In the manufacture of fine woolens, France holds a leading place, with one-eighth of the world's wool manufacturing capacity. The industry was originally based upon home grown wool, as it was in England and Belgium, but that is no longer true. The chief centers extend from the coal field of the northeast southward into Alsace, though other centers grew up in the interior during the World War.

Again, in the manufacture of the finest and most beautiful cotton fabrics, France is unsurpassed. There are three cotton-making regions: (1) in Normandy, with Rouen as a chief center; (2) in the northeastern section near the coal fields, with Lille as a center; and (3) in Lorraine and Alsace, with Mülhausen as a center. The reannexation of Alsace-Lorraine greatly increased the textile output of France; for example, it increased the cotton spinning capacity 27 per cent, the weaving capacity 36 per cent, the dyeing and bleaching capacity 100 per cent, and the print goods capacity over 100 per cent. The reasons for the emphasis on cotton manufacturing in these regions are (1) the convenience of receiving American raw cotton through Havre and Rouen in Normandy; (2) the advantage of local coal in the northeast; and (3) of water power in Lorraine and Alsace.

Metal Products.—Iron and steel manufactures have become increasingly prominent in France since the war. Recently the exports of iron and steel have reached 200 million dollars, or nearly equal to the combined value of silk and woolen exports. High-priced automobiles—in the manufacture of which France excels—are among the leading products. On the whole, however, France ranks far behind the United States, Great Britain, and Germany in the metal industries.

Typical French Manufactures.—With a shortage of coal and of many raw materials, and with a people of high artistic ability, France has found it to her advantage to manufacture articles in which labor, skill, and artistic design contribute largely to the value of the articles. These manufactures are quite in contrast to the crude, heavy articles, such as lumber and timber, and steel rails, bars, pipes, and plates, in which the material itself forms a considerable part of the value of the product. When one buys typical French manufactures he pays mainly for the work and skill that the articles represent, not for the material in them. Such goods are the beautiful fabrics and laces, cut glass, porcelains, jewelry, millinery, ladies' gowns, toilet articles, tapestries, and hundreds of other articles in the making of which the French have no superior. However, the total value of French manufactures is only a fraction of the value of British or American manufactures.

French Waterways.—Both France and Germany make more use of interior waterways than do Great Britain and the United States. France has about 7,000 miles of inland waters used for navigation; these include 17 canals, mostly shallow, and 17 improved rivers or parts of rivers (Fig. 220). Some of these are used very little, while a few are used a great deal. At times in the past waterways have carried nearly one-fifth of the traffic of the country; this was made up mainly of coal, ores, building materials, and farm products; yet even of these bulky commodities, the railroads carry much more than the waterways. The Seine may be ascended as far as Rouen by fair-sized ocean vessels, and as far as Paris by boats drawing 10 feet. The mountain-bordered Rhone is a swift, turbulent river, unsuited to navigation. The Saône, north of Lyon, is navigated for 170 miles, but its traffic is mainly down stream. The most important group of waterways is the one in the Paris basin between Paris and the eastern boundary of France (Fig. 220). In this region is a network of canals and improved rivers reaching to the coal fields, serving the many manufacturing centers and connecting French rivers with those of Belgium and Germany. About one-half of the freight that enters Paris comes by water, and 75 per cent of this is coal and building material. It is said that water rates average about 20 per cent lower than rail rates.

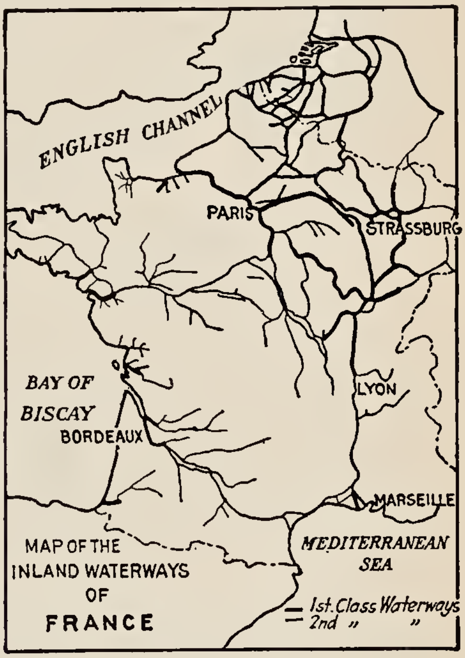

Fig. 220.

French Highways and Railways.—France is a country of excellent roads. A large part of the country is fairly level, road building material is abundant, labor in the past has been inexpensive and France has an enlightened government. There are some 25,000 miles of national roads of excellent quality, and 10,000 miles of provincial roads of good quality. Not only are they well made, but they are well cared for, a condition often lacking in America. In the United States we have in far too many instances built expensive roads and then left them to be poorly cared for and soon to be ruined.

The extent and distribution of French railways reflect the physical and economic conditions of the various parts of the country. There are six railway systems in France. Five of them radiate from Paris which, because of its topographic situation, was the center of French inland transportation before the railway era. The regions best served by railways are the industrial north and northeast. Northwestern France has many railroads but is mainly an agricultural region and has not enough freight to make all of these lines pay. Consequently, as in Canada, a large part of the railways in this district have been placed under government ownership. The rough and relatively poor Central Plateau has not so many railroads. One of the important lines of the south is that which connects Bordeaux with the Mediterranean coast through the natural highway of the Garonne valley. The wealthiest of French railroads and the most used is the Paris-Lyon-Mediterranean which connects Paris with the great port of Marseilles through Dijon and the Saône-Rhone depression. An important link in European transcontinental service is formed also by the French lines which connect England, via Southampton and Cherbourg or Dover and Calais, through Paris, Belfort and the Swiss tunnels with the ports of Italy. The loco-

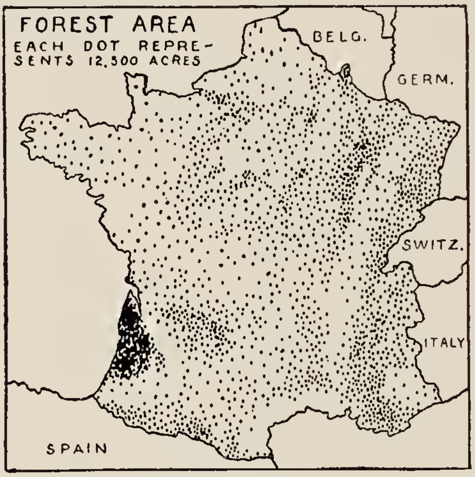

FIG. 221.—The forests of France are found mainly on the rough lands of the East and South but include the cultivated, turpentine forests of the "Landes," in the southwest.

motives and cars of French railroads are, as a rule, smaller than those used in the United States, but the service is excellent.

Foreign Trade.—France is one of the important trading nations. After the overthrow of Germany it ranked third in total value of foreign trade, but more recently Germany has again attained third place. Like most European countries, France imports more than it exports. Owing to its high food-producing power, it pays out less for imported food than for imported raw materials.

The articles which France purchased abroad to the value of 100 million dollars or more were:[1]

Coal	$136,000,000
Raw cotton	165,000,000
Raw wool	187,000,000

Leading exports of France are:

Iron and steel products
Silk fabrics
Cotton fabrics
Women's wear
Woolen goods
Automobiles

It is interesting to note that the three chief imports are for use mainly in manufacturing, while all of its leading exports are manufactures, four of the six being textiles and the other two iron and steel products. The above items are only a few of the many hundreds of articles which enter into French foreign trade. The importance of luxuries in French exports may be seen from the list of leading items sold to the United States in one year:

Antiquities	$15,000,000	Silk goods	$8,000,000
Perfumery and soap	14,000,000	Beads and spangles	6,000,000
Gowns and costumes	13,000,000	Gloves	5,000,000
Pearls	9,000,000	Paintings and statuary	5,000,000

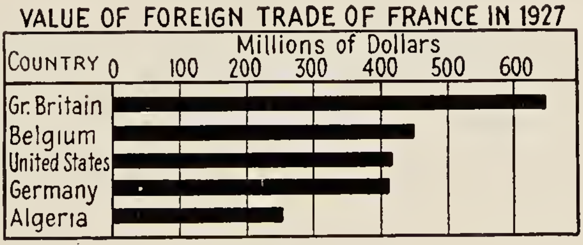

FIG. 222.

France, of course, trades with all countries, but half of its commerce is with five of them: Great Britain, Belgium, the United States, and Germany. The fifth is Algeria, which is treated as a part of the French Republic (Fig. 222). Creditable as is the showing made by France in the world's trade, it is below what might be expected from the superior geographical position of the country and the abilities and wealth of the French people.

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[1] Three-year average 1926–28.

The Chief Ports of France.—France has upwards of 40 ports capable of receiving ocean-going vessels; about 18 of these are of importance, but none of them is really excellent by nature. Through extensive improvements, many have been brought into highly serviceable condition. The leading ports on the English Channel are Havre, Rouen, and Dunkirk, with Cherbourg the chief port for the American passenger traffic (Fig. 223). On the Mediterranean is Marseille (Fig. 224); on the west coast, Bordeaux, St. Nazaire, and Nantes. Havre is the chief port for the receiving of American cotton and Brazilian coffee. Marseille is the port of receipt and shipment from and to Algeria, the Mediterranean countries, and the Far East. It is one of the world's leading cities in receipt, preparation, and sale of vegetable oils and products made from them. These include olive oil, palm oil, soy bean oil, peanut oil, cottonseed oil, and a number of others; over 40 oil-seed mills operate in the city and there are 50 soap-making establishments. Bordeaux is the principal wine shipping port and is one of the leading ports for the receipt of South American products. Paris has a larger water-borne traffic than any ocean port of France, but most of it is local and domestic traffic, not foreign trade.

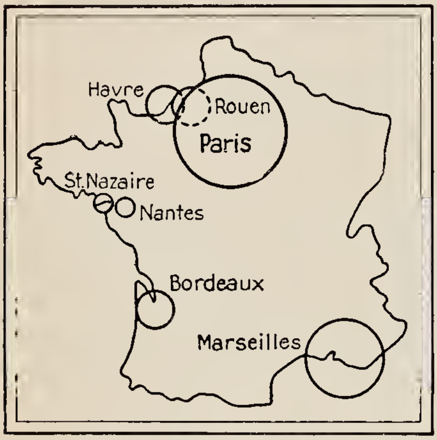


Fig. 223.—Relative commerce of the chief ports of France.

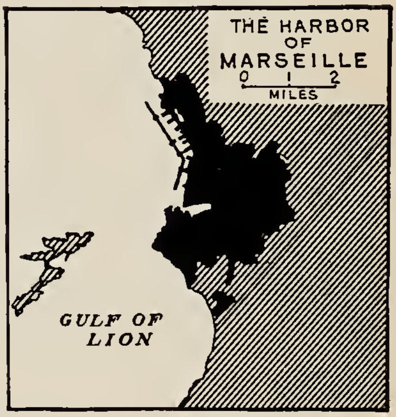
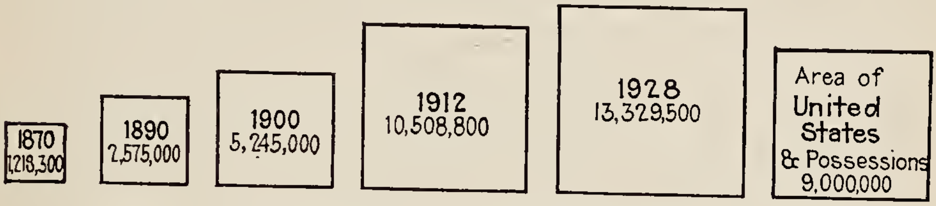


Fig. 224.

COLONIAL POSSESSIONS

Africa.—After France had lost or disposed of her extensive colonial possessions in America, including parts of the West Indies, eastern Canada, and Louisiana Territory, the nation began a period of colonial expansion in Africa (Fig. 225). Algeria on the Mediterranean coast was acquired (1830); then from this coast as a base, French influence and control pushed into and across the Sahara and the Sudan and connected up with the colonies on the Gulf of Guinea. Tunis, on the north coast, and the large island of Madagascar, off the east coast, were acquired, and, later, most of Morocco, in the extreme northwest of Africa, came under French domination. Finally, by the defeat of Germany in the World War, France became mandatory for the greater part of the German colony of Cameroon and about half of Togoland. The area of the French dependencies in Africa now exceeds the area of the United States, and also exceeds the area of British dependencies in Africa (Fig. 315).

Other Dependencies of France.—French Indo-China in Asia is larger than France and is of considerable value. French Guiana on the north coast of South America is of small value. The French islands in the West Indies (page 280), the various groups in the Pacific and Indian oceans, the French mandatary in Syria, certain small areas in India, and a few other minor possessions taken in connection with the colonies in Africa make up a colonial empire of wide extent and of possible future value. Most of the French dependencies are not in the attractive parts of the world; they are mostly tropical, arid, or semi-arid, and are peopled by backward races, although Algeria is being steadily developed and is a thoroughly valuable region.



GROWTH OF TERRITORY UNDER FRENCH RULE
AREAS IN SQUARE KILOMETERS

Fig. 225.

BELGIUM

Favorable Commercial Situation.—The little kingdom of Belgium is about one-fourth the size of Pennsylvania, but has a population of well toward 8 million, making it the most densely populated country in the world. Its greatest commercial asset is its excellent location. It lies near the focus of great ocean routes, touches three leading commercial nations—France, Germany, and the Netherlands, and is close to a fourth, England. It is also practically at the mouth of the Rhine, the chief commercial river of the continent. Belgium's strategic location insures that steamships from every part of the world will pass its doors in almost constant procession. It is, however, a buffer state between two rivals—France and Germany—and in time of war in western Europe it is always in danger. Its location has made it one of the chief battlegrounds of Europe in war after war. About half the people are Flemings, who resemble the Dutch and speak a language similar to Dutch, and about one-half are dark-eyed Walloons, who speak French, which is the official language of the country.

The High Development of Agriculture.—The coastal strip of Belgium is low, sandy, and unproductive. A little of it, like part of the Netherlands, is below sea level and is protected from the sea by dikes. The central half of the country is very fertile, and is about the most intensively cultivated part of Europe. The population is dense, labor is relatively cheap, the people are industrious and fond of agriculture, and about 60 per cent of the land is cultivated intensively. The amount of food that the little country yields is astonishing, yet it is insufficient for the large population. There are about 300,000 little farms averaging only 2 or 3 acres in size, and over one-fourth of them are cultivated by their owners, an excellent showing for a European country. Four cereals —wheat, oats, rye, and barley—and two vegetables—potatoes and sugar beets—occupy more than half the cultivated land, and the yield per acre is very high because of the intensive cultivation. The region about the city of Ghent is one of the greatest horticultural regions in Europe, growing plants and bulbs for export. Land in this region with its greenhouses and other appurtenances had a value as high as $10,000 an acre, but the industry was virtually ruined by the German army in the war. Flax has long been one of the distinctive crops of Belgium, grown largely along the river Lys (in Flanders) whose waters are said to be peculiarly suited to retting the flax in preparation for the manufacture of linen. Strangely enough, Belgium exports most of its fine home-grown flax to the mills of Great Britain, and imports Russian flax for its own mills. The emphasis upon crops like sugar beets, potatoes, flax for linen, and plant bulbs, all of which are crops that demand a great amount of hand labor, is logical in a country like Belgium where land is scarce and labor is abundant. Although Belgium is one of the most highly developed countries in factory industries, it has nearly as many people employed in agriculture as in manufacturing, although many factory workers live on small farms which they and their families cultivate.

The Fundamental Importance of the Coal Deposits.—One of the important coal fields of Europe extends from northern France, across Belgium into Germany (Fig. 216). Part of the coal is of coke-making quality and forms the basis of the great metallurgical industries of Belgium. Unfortunately, the coal beds have suffered folding and faulting which make some of the coal somewhat difficult to mine, and a part of it extends to such depths in the earth that it can be recovered only at high cost. However, the abundant labor and moderate wages of Belgium have developed a great coal mining industry that has won for the little country the name "The Workshop of Europe." The valley which contains the coal field is the great east-west highway between

Germany and France, and was used by the German army in 1914 in its plunge through Belgium into France. Along this valley extends one of the busiest industrial regions of Europe, with a variety of industries based upon coal. Most of these industries grew out of the earlier and simpler industries for which this region—especially Flanders—was famous in the Middle Ages.

The Metal Industries.—Formerly Belgium mined considerable iron within her own borders, but relatively little ore is now obtained from this source; however, the iron fields of Lorraine and Luxemburg are not far away, and from these sources the ore for Belgium's furnaces may be obtained cheaply. As a result, Belgium has become a leading manufacturer of machinery, arms, locomotives, rails, structural steel, and hardware. American, French, German, and British bidders for large steel contracts always have to count on low bids by Belgian manufacturers. The city of Liége in Belgium was second only to Essen, home of the great Krupp works, in the manufacture of arms.

Formerly Belgium mined considerable quantities of zinc, and upon this source built up a zinc smelting industry as a part of her metallurgical interests. These zinc ores are practically exhausted but the smelters have continued and have grown, using imported ore, especially from Australia. The closely related lead smelting industry is less prominent. In Belgium, as in all the leading industrial countries, the metal working industries are among the very first in importance.

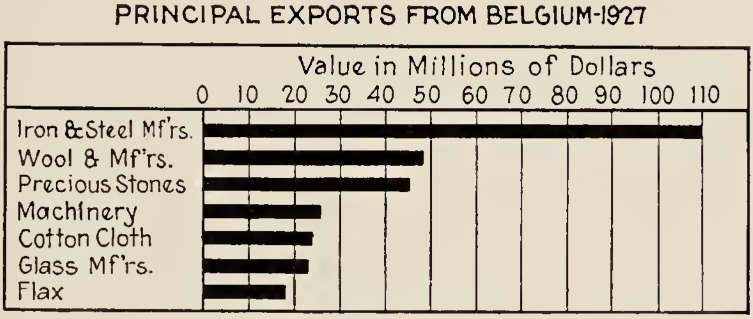


Fig. 226.

Textile Manufactures.—In the Middle Ages, Flanders was the center of textile manufacturing in Europe. A great many of the weavers and spinners whose skill built up British leadership in textiles were Flemings who came to England to work because the English industries were not disordered by the military operations which frequently interrupted or destroyed peaceful pursuits on the continent during the Hundred Years' War (1337 to 1453). Ghent, Bruges, Ypres, and a number of other cities were textile centers of great wealth and activity. During this period Ghent had five times the population of London, and Ypres four times. About 1040, Bruges was the chief wool market of the world, and in the sixteenth century Antwerp was the chief port. With the change from hand to machine work, English leadership in textile making steadily increased. However, Belgium's skilled labor and her coal enabled her textile industries to continue and to grow (Fig. 226). At one time the wool came mainly from nearby parts of western Europe, including England, but now it is mainly received from over seas. Great quantities of unwashed wool are imported, washed, and reexported, causing wool to appear as both a leading import and leading export of Belgium.

The many linen mills owe their origin to the flax which is grown in Flanders and largely retted in the river Lys. In 1914, of 28 flax spinning mills in Belgium, 13 were in Ghent. The lace-making industry, which is said to have formed a household occupation for 150,000 persons at one time, has declined or given place to machine made lace. The "persistence of a rooted industry" is excellently illustrated in the great textile interests of Flanders which have been continuous for a thousand years. The cotton comes mainly from the United States, and full cargoes from New Orleans, Galveston, and other American ports reach Ghent by a ship canal from the Scheldt River. The flax now comes mainly from Russia, and the wool mainly from Argentina.

Other Manufactures.—Belgium is one of the foremost countries in the manufacture of glass, including fine plate glass, 95 per cent of which is exported, much of it to the United States. A large part of the so-called French plate glass is made in Belgium. Belgium is also a large manufacturer of carpets, of artificial silk, of aluminum goods, of chemicals, of paper, and of many other products. It is, indeed, one of the most highly developed manufacturing countries. Brussels is the capital and industrial center of the country.

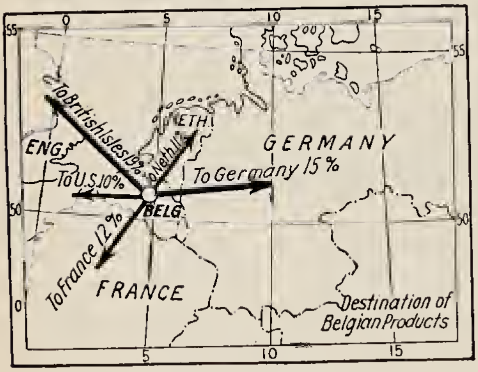


Fig. 227.

Commerce and Colonies.—Antwerp, the chief port of Belgium, is 50 miles up the Scheldt River whose lower course is in the Netherlands, much to Belgium's dissatisfaction. The port of Antwerp not only serves Belgium but carries on a large transit trade for goods entering western Germany and even Switzerland. The foreign trade of Belgium is remarkably large, ranking about fifth in Europe, though it is one of the smallest countries. The exports are largely manufactured articles, notably textiles and metal products (Fig. 227). Belgium has one large colony, the Belgian Congo in central Africa, with 80 times the area of the home country.

Luxemburg is a small semi-independent state wedged in between France, Germany, and Belgium. Before the World War, it maintained close relations with Germany, but after the war it established political and economic connections with Belgium. It is a rather rugged land whose only important resource is iron ore, a part of the Lorraine formation.

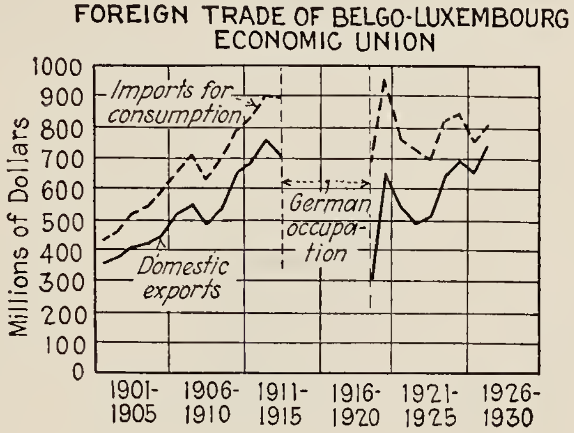


Fig. 228.

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CHAPTER XXVI

WEST CENTRAL EUROPE

THE NETHERLANDS

Small Size, Excellent Location.—The Netherlands—often called Holland—is one of the smallest of European countries; its area is only one-fourth that of New York. The population is dense—over 500 to the square mile—yet less dense than it is in Belgium. The land is mainly built of the alluvium deposited by the Rhine and the Maas (or Meuse) to form a low, flat delta, over a part of which glacial drift has been laid down. Only about one-third of the land is highly productive, though three-fourths of it is utilized for crops or pasturage. The greatest geographical asset of the little kingdom is its situation at the mouth of the Rhine, Europe's most used river, and on the shore of the North Sea. It touches Germany and Belgium and is near Great Britain and France, four of the leading commercial nations of Europe. The position of the Netherlands, even more than that of Belgium, gives the country excellent opportunities for transit trade with Germany. Like Belgium, from which it was separated in 1830, the Netherlands constitutes a buffer state in whose continued independence all western Europe is concerned. The strategic location of the country has enabled the Dutch to become one of the great commercial peoples of Europe.

The Fight with the Sea.—The exceptional opportunities for oversea and overland trade provided by the geographical situation of the Netherlands has justified an enormous expenditure of labor in reclaiming and protecting the low-lying lands of the delta. One-fourth of the land is actually below sea level, and one-half is less than a meter in elevation (Fig. 229); 38 per cent is protected from inundation by natural or artificial embankments or dikes along the seacoast and along the rivers. On the coast the winds have heaped up the sand into a long line of dunes averaging 30 feet in height. Where dunes are lacking, artificial dikes have been constructed. The river banks must be diked as well as the seacoast, and thousands of miles of drainage canals have been constructed. Some of the lowlands can be drained directly into the sea or the rivers at low tide, but lower lands can be kept drained only by constantly pumping the water from lower drainage ditches into higher ones and finally into the main rivers which carry the surplus water to the sea. Formerly windmills were employed for the pumping, and the countryside was thickly dotted with them, but more recently pumping engines have come into use.

The diking and draining of the land has gone on for many hundreds of years, and a new project for draining the half-million acres of the Zuider Zee is now under way. This reclamation project will probably cost 100 million dollars, but the reclaimed land is exceedingly productive, and has an estimated value of $500 to $700 an acre. The great cities of the Netherlands—Rotterdam, Amsterdam, The Hague, and many others—are built on land that has been reclaimed from the sea.

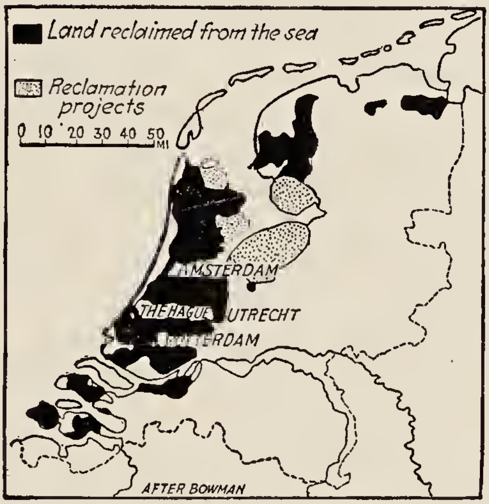

Fig. 229.—Netherlands and its reclaimed land.

The Absence of Minerals.—Built of river deposits and sea muds, the land of the Netherlands is practically destitute of all minerals except clay. In the extreme southeast, off the delta, are deposits of low-grade coal which were regarded as of little value until the World War forced the Dutch to use them. In this deficiency, the Netherlands differs widely from its neighbors, all of which have coal, iron, and other minerals.

UTILIZATON OF LAND IN THE NETHERLANDS

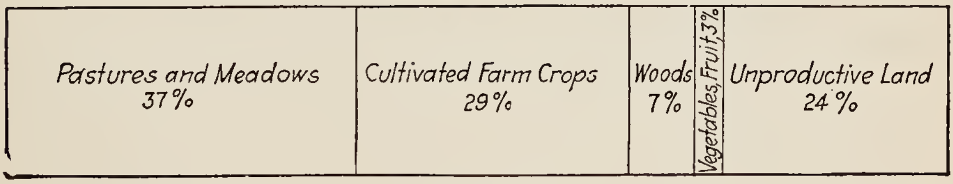

Fig. 230.

Necessarily this lack, coupled with the absence of water power, has stood in the way of manufacturing. On both sides of the Rhine delta in Germany and in Belgium, a great expansion of manufacturing has occurred, but in this the Netherlands has been unable to share in any large way.

The Intensive Character of Agriculture.—Only about 29 per cent of the land is suited to the cultivation of crops. In the past, farm labor has been cheap; the people are industrious; land is high priced and there are millions of people to be fed; hence every acre must yield to its limit. On the sandy land potatoes, rye, and buckwheat are raised; in the clay loams wheat, oats, and sugar beets; and in particularly favored localities large quantities of flower bulbs, small fruits, and garden vegetables. The little country can not feed its people, but it yields a surprising quantity of food.

A Land Famous for Its Dairy Cattle.—The outstanding industry of the Netherlands is dairying and the manufacture of milk products (Fig. 198). This is a direct response to the climate and soil of the country. Much of the richest land lies in the reclaimed areas whose clay soil is always moist, an ideal condition for the growth of the nutritious grass upon which cattle feed and yield milk in abundance. The Dutch are excellent dairymen and have bred up a variety of cattle—the Holstein—which leads all others in the quantity of milk produced. There are 2 million cattle in this little country, most of them looked after with extreme care. In the Netherlands dairying is a science and it is the country people's greatest source of income. Famous brands of cheese are made, and butter of high reputation; also quantities of condensed and powdered milk. From 60 to 70 million dollars' worth of these products are annually sent abroad. Growing out of the dairy industry is a related one, namely, the manufacture of the butter substitute, *margarine,* made from animal and vegetable oils and fats and widely used in place of the more expensive butter; 200 million pounds of margarine are shipped from the Netherlands in a year. A large part of the general comfort and well-being of the country people of the Netherlands arises from the prosperity of their dairy industries.

Manufacturing Only Moderately Developed.—A country without good coal and without iron or any other metal is handicapped so far as manufacturing is concerned. Thus handicapped the Dutch people have devoted a greater part of their energies to other economic activities for which their country is more favorably endowed, particularly to dairying and to commerce. From the abundant clays, pottery, tile, brick, and other clay products are made. The distinctive blue pottery of Delft, for example, has been famous for centuries and in its palmy days the old town had 30 earthenware factories. Amsterdam is the greatest of all diamond-cutting cities, with 70 establishments and 13,000 skilled workmen. The industry dates far back to the days when Amsterdam was one of the leading banking and jewelers' cities of Europe, but it seems to have no geographical explanation. The chief manufacturing industry is that of textile making—cotton, woolen, linen. and a small amount of silk. In some 600 mills—large and small—upwards of 50,000 people are employed, yet even this large number equals only the number employed in a single automobile factory in Detroit.

The Valuable Colonies.—Two or three centuries ago the Netherlands was almost if not quite the leading commercial and maritime power of the world. Between the Netherlands and Great Britain a long and bitter fight for mastery of the sea was waged, and the British won. But the Netherlands held the Dutch East Indies—the richest of tropical colonies—and today the area of the Dutch colonies is 56 times that of the home country, and the population is 8 times as great. The commerce between the East Indies and the home country is large and profitable. Dutch Guiana, on the northern coast of South America, and the nearby island of Curacao are of relatively small importance as colonies.

Large Foreign Commerce.—The Dutch are inherently a commercial and seafaring people, as centuries of their history have shown; and shipbuilding, the ocean fisheries, and the carrier trade are important phases of the economic life of the nation. The Dutch merchant fleet is among the leading five of the world, and the foreign commerce of the Netherlands, even before the World War, exceeded that of Russia and is now far in advance of that country. Cheese, butter, margarine, eggs, and cured meats, are the leading group of exports. Cut diamonds and cotton goods are also important exports. The transit trade with the Rhine Valley is one of the important phases of Dutch commerce. The Netherlands is criss-crossed with numerous canals and canalized rivers which bring many parts of the country within reach of ocean-going vessels. Rotterdam is one of the foremost European ports, and Amsterdam, though less important, has a large foreign trade.

GERMANY

Causes of Germany's Progress between 1871 and 1914.——The progress in manufacturing, commerce, and national prestige achieved by the German Empire in its 47 years of existence was phenomenal. The causes and conditions which promoted this achievement were partly geographical and partly non-geographical. It is probably true that the causes lay more in the German people than anywhere else. The vigor and forcefulness of their leadership, the centralized and aggressive government headed for many years by an ambitious emperor, the devotion of the nation to education, to scientific investigation, to efficient methods, and to industriousness and thrift, the exceptional degree to which science, education, government, capital, and industry joined hands in pushing forward everything that would advance the interests of Germany—all these and other similar causes must be given full weight in considering Germany's progress between 1871 and 1914. But these are only incidentally matters for study in economic geography, and, though fully recognized, they do not belong to our discussion.

Not

On the other hand, there is another group of factors which are geographical and which played a large part in the economic upbuilding of modern Germany. Such factors are (1) the location of Germany in the heart of the leading industrial and commercial continent; (2) the wealth of coal, iron, potash, and other minerals contained within her borders; (3) the large food-producing power of her land under scientific agriculture; (4) the forest wealth under methods of sane conservation; (5) the waterways, both actual and potential; (6) the invigorating climate. These are the distinctly geographical advantages which were so energetically seized upon by the German people in building up the powerful nation that later brought about its own downfall.

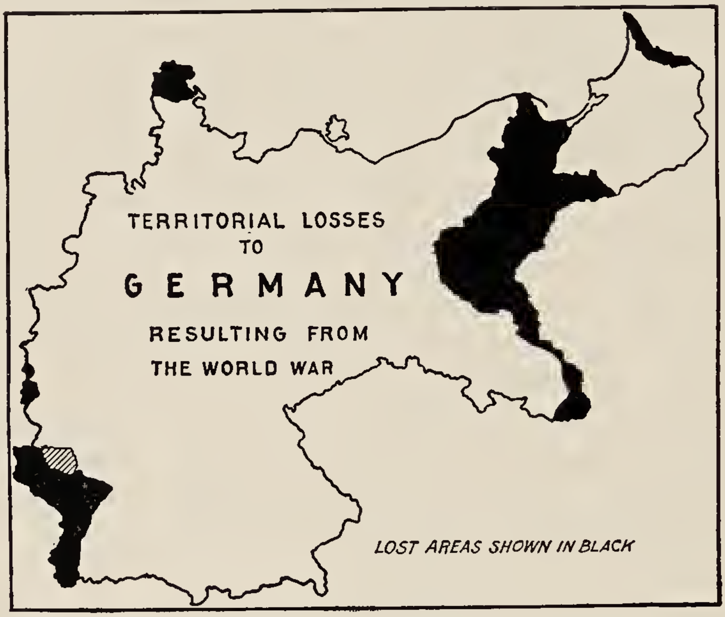

FIG. 231.—This map takes no account of the possible loss of any part of the Rhineland or Ruhr Basin which have been occupied by the French.

All conditions in Germany since August, 1914, have been abnormal, and will long remain so. The conditions of industry and foreign commerce in the years immediately following the war are not typical or permanent. Present conditions are not fully characteristic of the real Germany, but are becoming increasingly so.

The Homeland of the Germans.—Present Germany is smaller than France and considerably smaller than Texas, but it has a population of 60 millions. More than half the country is a glaciated, sandy plain, naturally infertile and dotted with swamps and wooded areas. As a homeland, the north German plain is far from attractive, but under the scientific methods of German agriculture and a generous use of fertilizer, it became highly productive. South Germany is a dissected plateau of varied physical features with extensive forests, fertile valleys, and mountains that attain a height of nearly 10,000 feet. Across the country from southeast to northwest flow four good-sized rivers all of which are used for navigation; of these the Rhine is the most important. The climate is prevailingly continental with the stimulating characteristics which belong to the prevailing westerlies. In the east the winters are cold and the snows heavy. Rainfall is ample for crops and diminishes in quantity from west to east; western and southern Germany are milder than our northern states, though considerably farther north. By generations of labor, many of the North German swamps have been drained; over half of the total area has been brought under crops, and lands best suited to forests have been left wooded or have been reforested.

The short North Sea coast is far more important to German commerce than the Baltic coast four times as long, for the latter has no first-class harbor. The estuaries of the Elbe and Weser with their two great ports on the North Sea—Hamburg and Bremen—are the commercial water-gates of Germany. ✓

AGRICULTURE AND FORESTRY

Methods Efficient and Scientific Rather Than Intensive.—One of the conspicuous traits of the German character is its bent for efficient and scientific methods of work. It is seen everywhere in Germany. Germany's vast deposits of potash, home supplies of phosphates and manufactured nitrates supply the three essential fertilizers. Intelligent rotation of crops is practiced; much livestock is kept and the animal fertilizers are returned to the soil. In this connection the report of an American consul in Germany is interesting.

> "Notwithstanding the decline in Germany's agricultural population the country has, by a marvelous system of intensive cultivation and soil stimulation, maintained a high position among the agrarian countries of the world; this is the more remarkable when the inferior rocky and sandy nature of much of the soil is taken into consideration. Germany's pre-war favorable crop returns were due to the general spread of scientific methods and the increasing liberal use of chemical manures. Germany alone normally uses as much potash salts as all the rest of the farming world together. And no other country anywhere has done more to stimulate the spread of scientific agricultural knowledge; more than 100,000 agricultural students were attending the various universities, training schools and evening classes at the outbreak of the war. And in normal times Germany's annual production of wheat, barley, cattle, pigs, milk, etc., amounted to nearly $2,000,000,000."[1]

Potatoes and Rye.—Sandy soils like those of North Germany are best suited to two food crops which thrive in light acid soils and cool summers—potatoes and rye. Enormous quantities of both are grown and used in Germany; 14 per cent of the cultivated land is devoted to potatoes, against 1.2 per cent in the United States, and the total production is several times that of the United States. Not only are potatoes the commonest food of the German people, but great quantities (40 per cent) are fed to livestock, and (10 per cent) are made into starch, flour, and alcohol. Nowhere else in the world are potatoes such an important crop (Fig. 232). Rye is the predominant cereal and occupies nearly four times as much land as wheat or barley (Fig. 283). Oats rank next to rye in acreage, but the summers are too cool and cloudy for corn. Rye bread and potatoes are the foods of the peasant population throughout central and eastern Europe.

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[1] Consul Frederick Simpich, in U. S. Commerce Reports, Apr. 1, 1920.

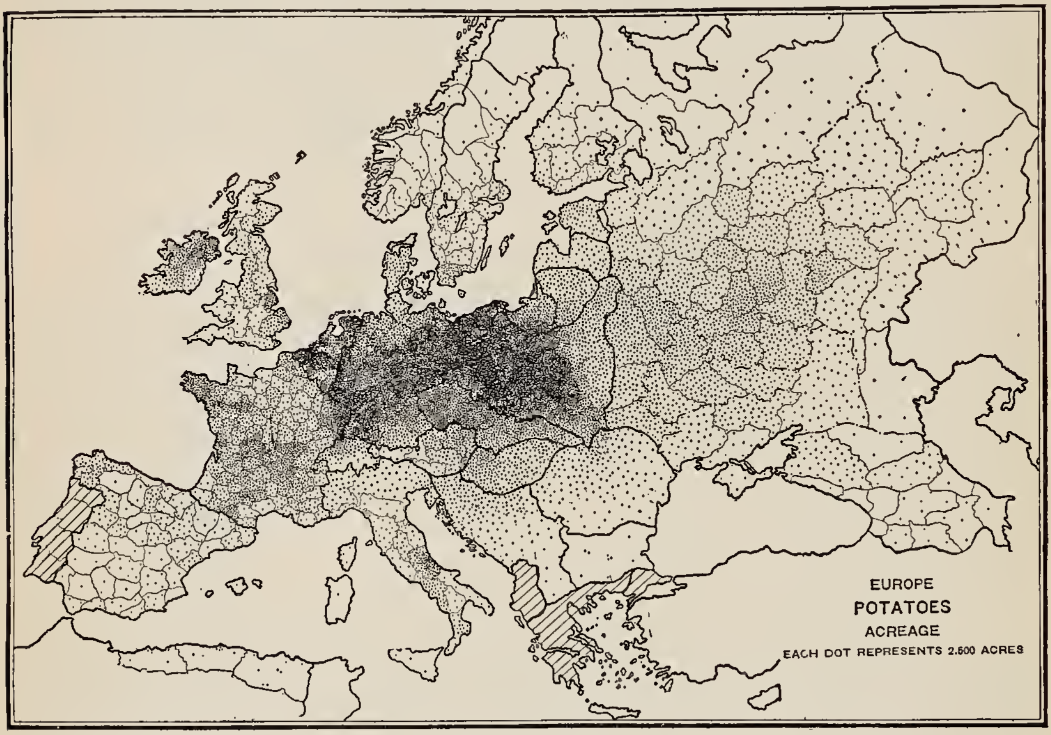

Fig. 232.—The cool, moist, plains of northern Europe lead the world in potato growing. (*U. S. Dept. Agr.*)

Sugar Beets and Beet Sugar.—To Germany is due a major part of the credit for the scientific studies by which the sugar-yielding qualities of the beet have been increased from 1 pound of sugar in 18 pounds of beets to 1 pound in about 6. The high development of the beet sugar industry in Germany and in other parts of central Europe had a revolutionizing effect upon sugar production the world over (Fig. 233). For many years the industry was aided by substantial cash bounties on exported sugar paid by the governments of various countries on the continent; but this practice has been discontinued. Before the World War the sugar supply of the world came about equally from cane and from beets. Germany was the leading producer of the latter for it is an industry to which the cool moist summer climate, certain soil regions, cheap labor, and the German interest in chemical industries are especially suited. All the great sugar beet areas of Europe were involved in the war;

the industry suffered severely and was years in recovering. The economies of large-scale production of cane sugar introduced by American corporations in Cuba, Hawaii, and Porto Rico are forcing beet sugar interests in Europe to the highest efficiency of production if they are to succeed in the export field in competition with cane sugar.

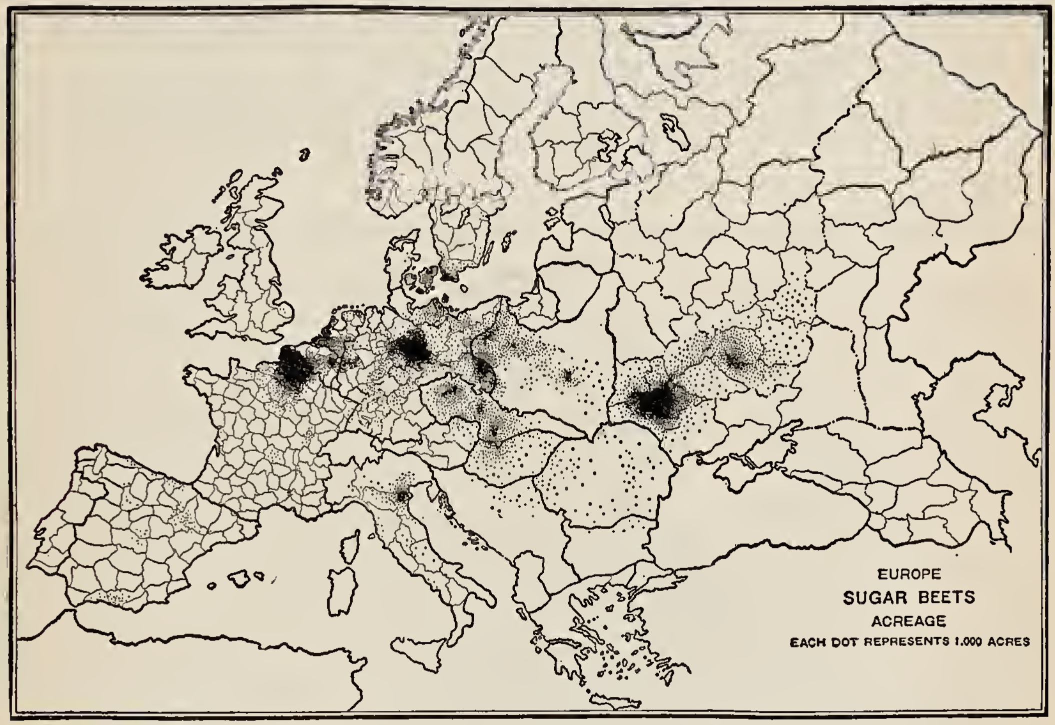

Fig. 233.—The sugar-beet fields of Europe. (*U. S. Dept. Agr.*)

Other Crops.—In the more highly developed countries of Europe, population is much more dense than it is in the United States, and land is more expensive—often too expensive to justify its use for pasturage if it can possibly be used for crops. By planting turnips, beets, carrots, mangels, and other fleshy root crops a great amount of feed suitable for farm animals can be raised on a small area of land. Corn can not be grown successfully in the cool climate of northern Europe, and root crops largely take its place in the agricultural rotation, and serve as a feed for livestock. Germany is the land of malt liquors, and hops are a characteristic crop in the south, especially in Bavaria. The vine is important in the west, notably so in the valley of the Rhine and its tributaries; tobacco is a crop of considerable value, mainly grown in the southwest, and hay and clover are crops of large acreage.

The Raising of Livestock.—Because other activities stand out more prominently in Germany, the raising of livestock is seldom mentioned with any stress; yet only four countries raise more cattle than Germany (India, United States, Russia, Argentina); each square mile of Germany has an average of about 100 cattle, as against 20 in the United States as a whole and 50 in the states that specialize in cattle raising (Fig. 198). Swine are as numerous as cattle, and Germany has more swine (Fig. 234) in proportion to area than any other country except Denmark, and more in total number than any other country except the United States. In meat, milk, butter, and cheese Germany closely approaches self-sufficiency. In this as in many other respects the Germans have sought to utilize their land and their resources to the fullest extent, and to make themselves as little dependent upon imported food as possible. The former Emperor insisted that Germany could be and ought to be self-sufficient in food production.

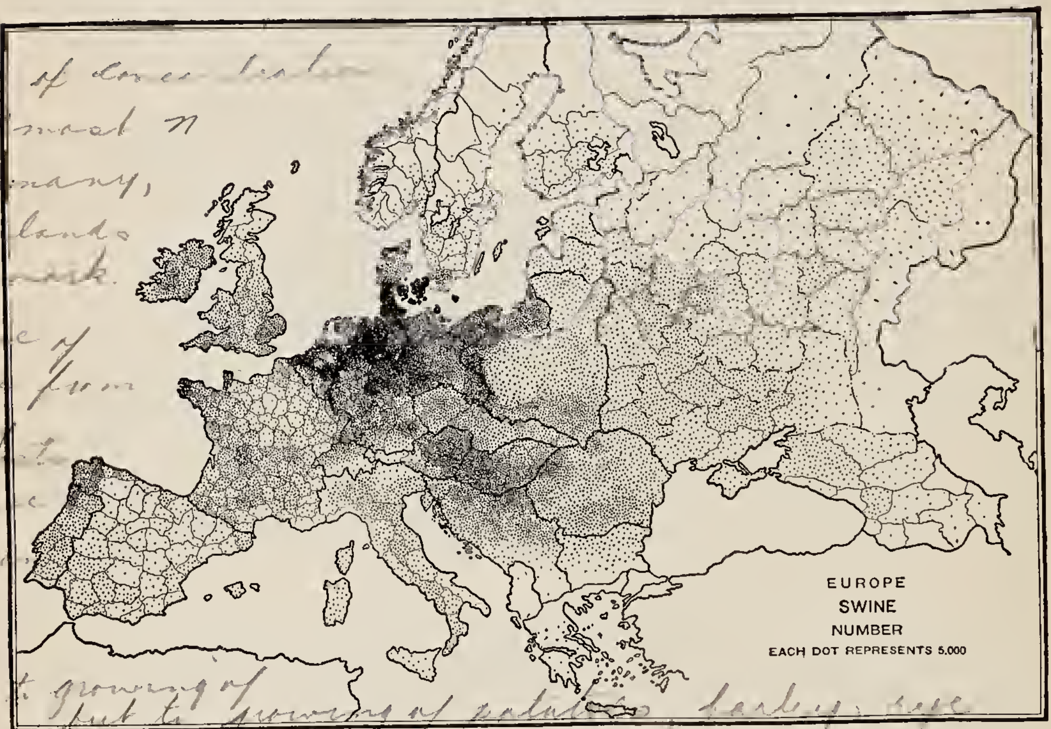

Fig. 234.—Swine raising in Europe is most intensive in the industrial regions and where potatoes and dairy by-products are most abundant. (*U. S. Dept. Agr.*)

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The Place of Agriculture in the Life of the Nation.—Not long ago Germany was more an agricultural than an industrial nation, but from 1890 to the World War it changed rapidly toward industrialism. Millions of people left the farms for the cities as they have been doing in the United States, and by 1914 scarcely one-third of the German people were engaged in agriculture. There is no uniformity in the system or size of land holdings, for there are many large landed estates, especially in the northeast, and also over 5 million small and medium-sized holdings (under 25 acres). As a rule, the farms are owned by the farmers who work them. About one-half of the land is under cultivation; roughly one-fourth is grass or waste, and one-fourth is wooded. The agrarian aristocracy of eastern Prussia were the power behind the German Emperor, the office-holding, militaristic uncompromising junkers to whom Germany owes a large part of her later woes.

At present Germany produces upwards of three-fourths of the food required by her people. A large part of the 18,000 square miles of land ceded to Poland at the end of the war is agricultural land that produces a surplus of food stuffs. Germany's territorial losses took a higher proportion of rural than of industrial communities, leaving the present Germany somewhat less self-sufficient in food production than before. One of the elements in the economic strength of pre-war Germany lay in the balance that was maintained between agriculture and manufacturing—not so good a balance as exists in France, but much better than exists in England.

Scientific Forestry.—Germany reduced forestry to a science. Nearly one-fourth of the land is too hilly or mountainous or too thin soiled to be profitably used for agriculture. Such lands are set apart, studied to ascertain what use can best be made of them, and if they can support forests of one kind or another, they are devoted to that use. Trained foresters manage these forests and determine what species of trees are best suited to the conditions, how thick the stand of timber should be, and what trees are ready for cutting. As fast as the mature trees are removed, the young trees are allowed to grow up in their places or others are set out from nurseries. So intelligently and carefully are the forest resources husbanded that Germany is able to produce a large part of her own requirements of fire wood, lumber, timber, paper pulp, and other wood products. Moreover, the forests protect the steeper slopes from soil wash and regulate the run-off. Largely under the influence of German methods, many other countries, including the United States, are introducing scientific forestry.

GERMAN WATERWAYS

The Rhine is the most important commercial river of Europe and is distinctly an international river, rising in Switzerland and entering the sea through the Netherlands, and now is under the control of an international commission. It is not quite so long (800 miles) as the Ohio River, but carries vastly more commerce than the whole Mississippi system. It has been dredged and straightened and otherwise improved and the many cities on its banks have built docks equipped with modern devices for loading and unloading cargoes. There were some 10,000 boats in the pre-war Rhine fleet, and the traffic reached the total of 40 to 50 million tons a year; the traffic is still large but not at its highest. It is not a deep river, ranging between 6½ feet in the upper stretches to 10 feet in the lower. In the United States, the Ohio and the lower Mississippi are deeper and have had more money expended on them, but

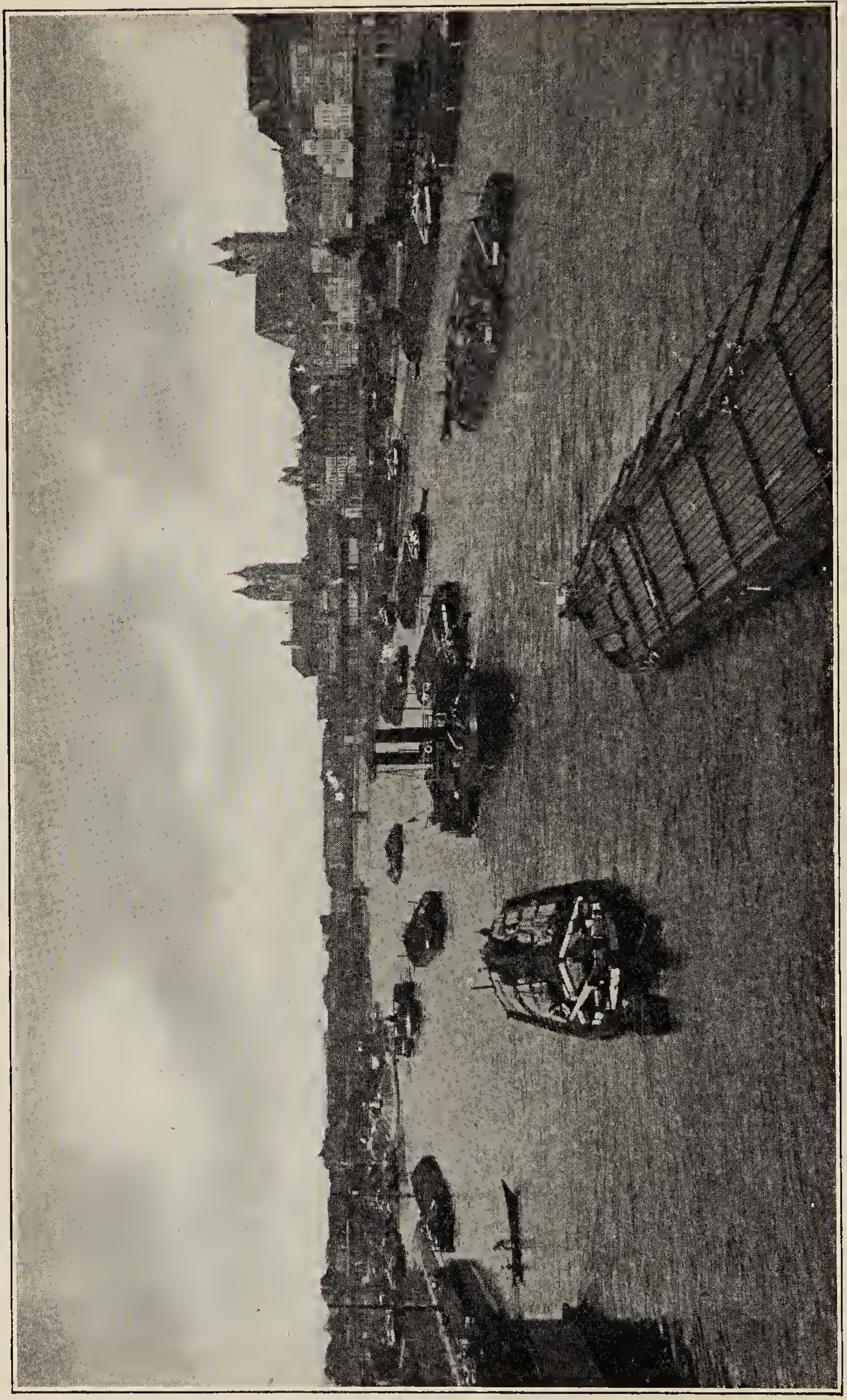
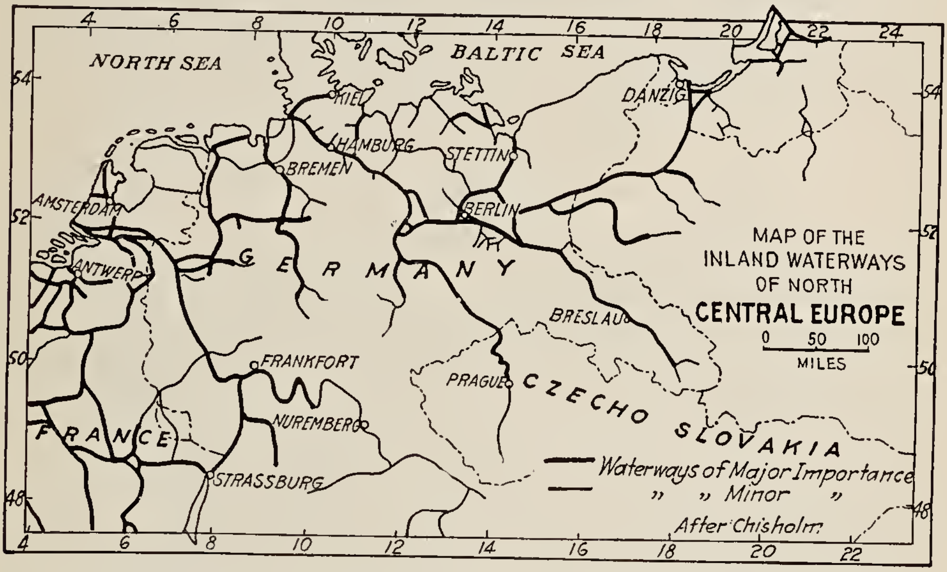


Fig. 235.—Barge traffic on the Elbe River at Magdeburg. (*U. S. Bur. Foreign and Domestic Commerce.*)

they are relatively little used. One important difference between the development of water transportation in the two countries arises from the density of population along the Rhine and along the Ohio and Mississippi. The Rhine has some 20 important cities on the river or directly tributary to it. Great coal and iron mines are nearby and a large tonnage of heavy, low-grade freight is available.

Germany has felt keenly the fact that the mouths of the Rhine are in a foreign country and not under German control. To provide an all-German water route from the great Westphalian industrial district to the North Sea, the Dortmund-Ems Canal was built, but it is used less than was anticipated.

Other German Rivers and Canals.—The Elbe (Fig. 235) and the Oder are the other German rivers of most usefulness. Near the mouth of the Elbe is the great port of Hamburg whose pre-war river traffic, like that of Rotterdam at the mouth of the Rhine, was greater than its rail traffic. The river rises in Czechoslovakia and is navigable throughout its entire course across Germany; by means of this river Czechoslovakia is made tributary to the North Sea rather than to the Mediterranean. The Oder is less used than the Elbe, and the Vistula, mainly in Poland, still less; yet all are used more than similar rivers in the United States.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MAP OF THE INLAND WATERWAYS OF NORTH CENTRAL EUROPE
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Waterways of Major Importance
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After Chisholm

Fig. 236.—On the whole Germany has the most complete and most used system of waterways in Europe.

A number of canals connect the German rivers with one another and with rivers in the Netherlands, Belgium, and France (Fig. 236). Certain ones of these are used a great deal, especially for the shipping of coal, iron ore, and building materials. In Germany the government controls both waterways and railways and they are forced to cooperate. Germany is pointed out as an example of what ought to be done with waterways in the United States, but evidence has been adduced which seems to show that if all actual costs are charged up to water transportation in Germany, it costs more than rail transportation does in the United States.[1] If the waterways are provided and maintained from the public treasury and are made free to shippers, the water rates may well be lower than rail rates, but at the same time the actual cost of the service to the public may be as great or greater than it is by rail. It has been said that Germany—all of whose policies were shaped with reference to her possible military needs—was willing to maintain her waterways at a loss because of their potential ability to relieve the railroads in time of war.

The Kiel Canal connects the North and Baltic seas across the narrow neck of land south of Denmark (Fig. 236). The original canal, completed in 1895, had a depth of 29½ feet and proved to be too shallow. Just before the World War, the depth was increased to 36 feet and the canal was otherwise enlarged to accommodate the largest battleships and liners, though liners have used it but little. The canal was placed under international control by the terms of the Versailles peace treaty in 1919.

MINERAL RESOURCES

Large and Well-distributed Coal Deposits.—Pre-war Germany had very large coal resources, but lost the Saar coal basin (Fig. 216) to France, and a large part of the upper Silesian coal field to Poland and Czechoslovakia. Its most productive field and the one containing the best coking coal is in the Ruhr Valley in western Prussia, which was occupied by French troops in 1923. Germany's greatest industrial district is situated on both sides of the Rhine in the vicinity of these coal fields. The upper Silesian field now under Polish control contains more coal than the Ruhr Valley, but it is of lower grade and is not so favorably located. Germany's pre-war coal production of nearly 300 million tons a year (including lignite) was only slightly less than that of Great Britain, and is now somewhat greater than the British production. The need of coke in the Lorraine iron district of France and the need of iron ore in Germany are now leading to a systematic exchange of these minerals. The possession of great coal deposits by Germany was one of the most fundamental factors in the expansion of manufacturing, commerce, and wealth in Germany; not so largely so, however, as in the case of Great Britain.

German Resources of Iron Ore Now Small.—With the return of Alsace-Lorraine to France, Germany lost iron deposits that yielded 75 per cent of all the iron mined in the empire, and reduced her reserves to about one-third their former quantity (Fig. 200). This loss is a serious one, for the remaining small deposits are not sufficient to supply Germany's needs, and the country will be largely dependent upon imported ores—mainly from Lorraine and Sweden. So essential to a military and manufacturing country is an assured source of iron, that no strong nation can be content to depend upon other nations for this metal. In the World War, Germany could have done little if it had not possessed abundant iron and coal, and the mills and factories in which to use them. An exchange of coal for iron with France would aid German industries, and Swedish ores can be secured at reasonable cost, yet such a plan leaves Germany dependent with respect to the most fundamental of all the metals, and handicaps the largest of her manufacturing industries (Fig. 237).

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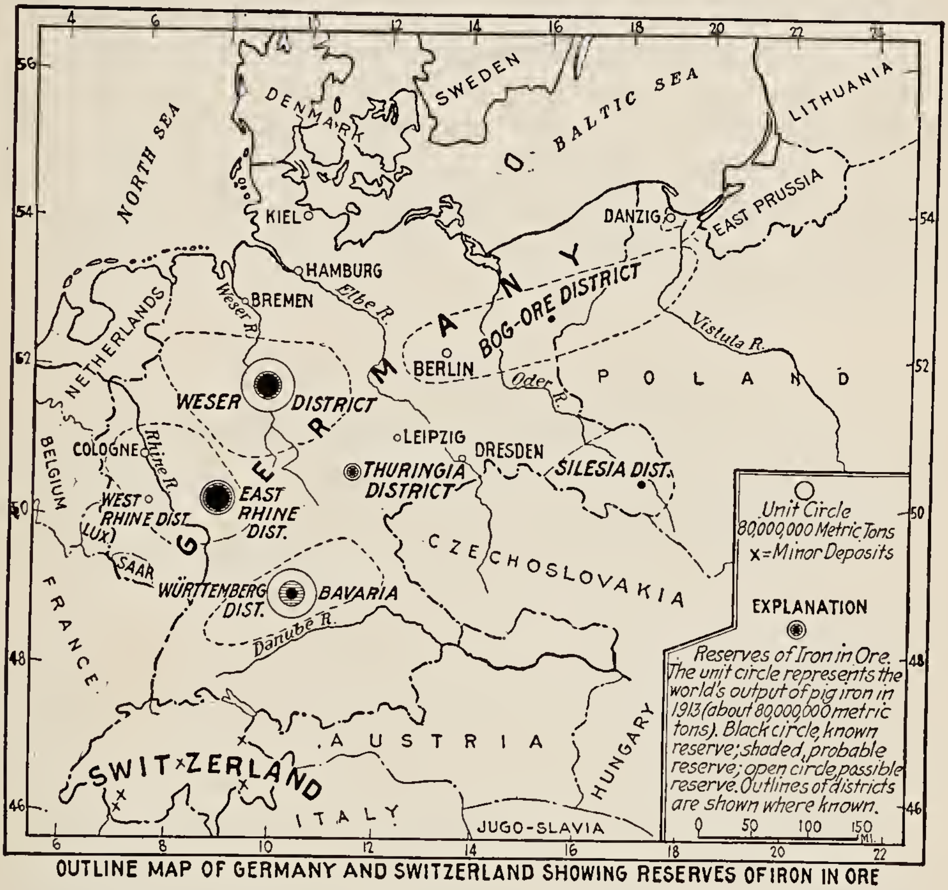
[1] MOULTON, "Waterways versus Railways."


NORTH SEA
DENMARK
SWEDEN
BALTIC SEA
LITHUANIA
KIEL
HAMBURG
BREMEN
Weser R.
Elbe R.
DANZIG
EAST PRUSSIA
GERMANY
BOG-ORE DISTRICT
NETHERLANDS
BERLIN
Oder R.
Vistula R.
POLAND
WESER DISTRICT
BELGIUM
COLOGNE
Rhine R.
LEIPZIG
DRESDEN
THURINGIA DISTRICT
SILESIA DIST.
WEST RHINE DIST.
EAST RHINE DIST.
(LUX.)
SAAR
CZECHOSLOVAKIA
WÜRTTEMBERG DIST.
BAVARIA
Danube R.
FRANCE
AUSTRIA
HUNGARY
SWITZERLAND
ITALY
JUGO-SLAVIA
Unit Circle
80,000,000 Metric Tons
x=Minor Deposits
EXPLANATION
Reserves of Iron in Ore.
The unit circle represents the world's output of pig iron in 1913 (about 80,000,000 metric tons). Black circle, known reserve; shaded, probable reserve; open circle, possible reserve. Outlines of districts are shown where known.
0
50
100
150
MI.
4
6
8
10
12
14
16
18
20
22
24
56
54
52
50
48
46

OUTLINE MAP OF GERMANY AND SWITZERLAND SHOWING RESERVES OF IRON IN ORE

Fig. 237.—Germany is now handicapped by her small reserves of iron ore. (*U. S. Geol. Surv.*)

Germany's Monopoly of Potash.—In 1843 there were discovered at Stassfurt in central Germany deeply buried beds of potash salt of fabulous extent—estimated at 20 billion tons—enough to supply the world's needs for 2,000 years at the present rate of consumption. The potash is mined by usual underground mining methods and can be produced rather cheaply. Less important beds of the same salt also exist in Alsace, now a part of France.

The principal use of potash is as an enricher of soils; it is one of three essential plant foods (potash, phosphorus, and nitrogen), and Germany had such a complete monopoly of the world's potash that she was able to use this monopoly to compel other countries to grant certain trade concessions to her. That monopoly is now broken by the loss to France of the potash deposits of Alsace. Germany has used enormous quantities of potash (60 per cent of total output) in building up her own agriculture, and, as already mentioned, the liberal use of this fertilizer is a large factor in the food-producing power of German soil. The presence of the potash and of large beds of common salt was also a factor in the upbuilding of the chemical industries in which Germany was so prominent.

Other Minerals.—Many of the mountains of southern Germany are ore bearing. Upper Silesia, part of which was severed from Germany, is especially rich in coal, zinc, and lead. This region produced 57 per cent of the lead and 72 per cent of the zinc mined in Germany before 1914. Moderate quantities of graphite, pyrite, copper, and silver are mined—not enough, however, for the country's needs. As a by-product of iron ore smelting by the Thomas process, large quantities of phosphate (for fertilizer) are produced.

MANUFACTURING IN GERMANY

Rapid Growth and the Reasons.—The rise of manufacturing in Germany during the generation preceding the World War was very rapid, and in 1914 that country ranked at least third and possibly second among the manufacturing nations of the world. For such an industrial expansion many conditions in Germany were highly favorable:

1. The geographical location of the empire gave it easy access to the markets of practically every European country.
2. It had ample supplies of coal, well distributed in various parts of the country.
3. It had iron, zinc, copper, lead, potash, salt, pottery clays, and a number of lesser minerals.
4. It produced a considerable variety of other raw materials including wood, sugar beets, hides, coal tar products, and other chemical materials.
5. The government actively interested itself in everything that aided the upbuilding of industry; enacted a protective tariff, assisted the merchant marine, developed waterways, gave favorable rates on the state-owned railroads, actively promoted technical education, and encouraged scientific research.

All these conditions were of course changed by the outcome of the war, and the post-war industries are much below the pre-war.

World Leadership in Chemical Industries.—Germany's leadership in the varied field of chemical industries is based upon two main factors:

1. Its mineral wealth, especially coal, salt, and potash.
2. The scientific interests and training of its people, especially in the field of chemistry.

Just as the artistic leanings of the French are reflected in the artistic character of their manufactures, so the scientific leanings of the Germans are reflected in the remarkable development of their chemical industries. The German universities were in the forefront in chemical investigations and in the training of industrial chemists. It was another example of the German practice of correlating education and industry.

The Aniline Dyes.—In the manufacture of aniline dyes, which have revolutionized the dye industry, Germany formerly had almost a monopoly —manufacturing about three times the quantity made by all the rest of the world. These dyes, of which more than 60,000 tints, colors, and shades are listed, are made from coal tar obtained as a by-product of coke-burning. At the outbreak of the war Germany was in almost complete control of the secret formulas, but during the war other countries developed their dye industries. In scores of other phases of the chemical industries, including tanning, brewing, distilling, the manufacture of drugs, medicines, explosives, glass, fertilizers, soaps, and artificial silk, Germany was a leader.

The Metal Industries.—With her deposits of iron and of excellent coking coal, Germany had the essentials upon which to build a great iron and steel industry, and this was done with characteristic thoroughness; and Germany is now surpassed only by the United States in the manufacture of iron and steel products. The greatest centers are in the coal field of the Ruhr Valley, particularly at Essen, the seat of the Krupp steel works.

Zinc, lead, and copper, though insufficient for the country's needs, give a partial home supply which is supplemented by importations.

Varied but Not Specialized Textile Industries.—It has already been pointed out that textiles and steel products are the leading articles of manufacture in practically all industrial nations. This is because they serve fundamental and widespread human wants. Germany, like the other manufacturing nations of Europe, produces only a minor part of the raw materials for its textile mills. Cotton is imported mainly from the United States and enters through the port of Bremen. Silk comes from the Orient, wool from Argentina and Australia, flax from Russia, and coarse fibers from many lands. The importance of textile manufactures is seen in the fact that cotton, silk and woolen fabrics and clothing made from them, yield an export value of nearly 300 millions dollars a year.

Other Manufactures.—That Germany leads the world in the manufacture of beet sugar has already been indicated (page 382). The famous breweries of Bavaria (20 in Munich) use the hops and barley of that country. The chief source of toys is Bavaria and the Black Forest, where thousands of families spend their winter evenings making dolls and Christmas toys and clocks. In almost every one of the 23 university cities are factories in which are made scientific and optical instruments, delicate apparatus, maps, and other articles in the making of which accuracy, scientific skill, and training are demanded. In such manufactures Germany leads the world. Copper and brass goods, leather and rubber products, electrical goods, machinery, clothing, and all the other products demanded by modern civilization are "made in Germany."

COLONIES AND COMMERCE

Acquisition and Loss of Colonies.—Since modern Germany dates from 1871, it had little opportunity to acquire colonies, for all of the desirable regions had already passed into other hands. Africa, however, had not been entirely parceled out, and in 1884 and 1885 Germany took possession of parts of Southwest Africa, of east Africa, and of Togoland and the Cameroons on the Gulf of Guinea. These were colonies of small value at that time, but of considerable potential value, for they are capable of yielding great quantities of tropical raw materials which the industrial nations need. Germany also acquired a number of insular possessions in the Pacific, all of which, together with her African possessions, were taken over by the Allies after the war.

Character and Extent of Foreign Commerce.—In 1914, Germany was one of the three great commercial nations. So rapid was her advance in this field that the other commercial countries were disquieted. Commerce is almost if not quite the dominant concern of all the great nations except Russia. Germany's aggressiveness in invading the markets of the world, and in building up her merchant fleet and navy was a threat at the very life of the British Empire and was the underlying cause of the growing hostility between the two nations. Germany of 1914 was better equipped with iron and raw materials than was Great Britain. She had abundance of coal, a larger and more industrious population, greater efficiency, better scientific development, and insatiable ambition.

In 1913, the last full year befor the World War, the exports of Great Britain, Germany, and the United States had about the same values, each exporting about 2½ billion dollars' worth of goods. On the side of imports, the three countries differed, for the United States is more nearly self-sufficient than either of the others, and Germany is more so than Great Britain. Germany's present imports exceeded her exports and the two give the total of 6 billion dollars, or 8 per cent of the total foreign commerce of the world. Since Germany is a nation of great industrial activity, her imports are mainly raw materials for her factories, and foodstuffs to supplement her home production.

The exports are, of course, predominantly the products of German factories—steel products of all kinds standing first; cotton, woolen, and silk fabrics; beet sugar, paper, chemicals and dyes, leather goods, toys, furs, scientific apparatus, porcelain and glass, electrical goods. Coal and coke are also sold abroad in large quantities.

Principal Regions Involved in German Commerce.—Of all the influences that decide the countries with which other countries shall trade extensively, *nearness* seems to be the most important the world over. This would be expected, for neighboring countries can exchange products most promptly and most cheaply. It is easier for countries that are near together to understand each other's needs and wants and to supply them. This applies more fully to a country's exports than to its imports, for it can import products like cotton, raw silk, rubber, coffee, and tea only from a limited number of regions that produce them, but it will send its exports to practically all countries. Of the five countries which buy German exports most largely, four are near neighbors, Great Britain, Netherlands, Czechoslovakia, and Switzerland. The United States ranks third as a buyer of German goods, but first as a supplier of German imports. Argentina and India are two other distant countries whose total trade with Germany is large. It as an interesting fact that the three chief rivals for world trade are the ones that had the largest trade with one another—the United States, Germany, and Great Britain. Evidently the more our rivals' trade grows the more our trade with them grows; their prosperity becomes our prosperity, and their depression our loss. The whole commercial world is so closely knit together that in the long run all prosper and suffer together.

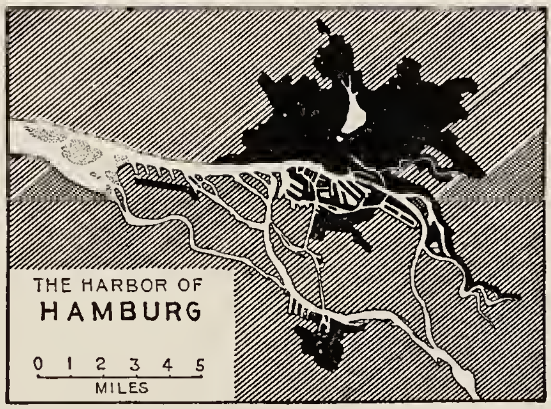


Fig. 238.—The intricate harbor of Hamburg has been dredged out of the banks of the Elbe. City area in black.

Switzerland

Economic Conditions.—Switzerland has little agricultural land, does not touch the sea, and has practically no coal or iron. It has mountain pastures and is making the most of its opportunities for dairying. It touches several of the principal countries of Europe and is thus assured of markets for whatever it may produce. It has much water power (Figs. 202 and 240) and a large population of industrious, skilful workers. General agriculture and direct ocean trade are both out of the question. With its necessity of importing coal and all raw materials, Switzerland can scarcely compete in the ordinary lines of manufacturing with more favored countries like Germany, England, or Belgium, but it might succeed in highly specialized manufacturing which uses little raw material and coal and a great deal of skilled labor; and this is precisely the procedure that the Swiss are following.

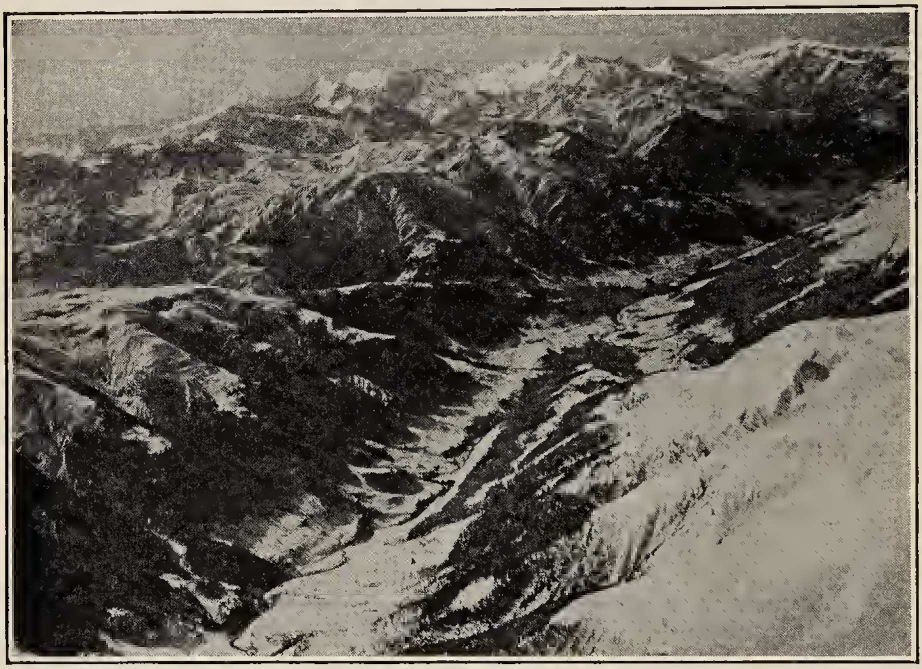


Fig. 239*a*.—The high Alps of Switzerland, sparsely inhabited and little used.

It will be pointed out later (page 409) how conditions in *Denmark* have led to intensive dairying. It will be seen that four little countries with their enlightened government, favorable location, and intelligent people have found prosperity in their own way—each making use of its natural advantages and following lines marked out by the particular geographical conditions under which it finds itself.

Effect of Location and Mountainous Topography.—The greater part of Switzerland's 4 million people live in the northern two-fifths of the country, which is a hilly plateau. Here agriculture and transportation are not particularly difficult, and here are located all the important Swiss cities (Fig. 239*b*). The central location of the little country makes it the cross-roads of several great routes of traffic, and offers ready access to the markets of four of the important countries of Europe. Its glaciers, mountain lakes, Alpine peaks (Fig. 239*a*), green valleys, superb roads, and its 2,000 hotels have made it a summer playground. In normal times caring for tourists gives employment and income to a considerable part of the population. In point of money received this is one of the foremost industries of the country. Switzerland includes the very heart of the Alps, whose narrow valleys separated by high mountain walls have fostered in the people an intense spirit of independence and devotion to democracy. Its laws are the most liberal in the world, and it is the asylum of exiles from most of the countries of Europe. There is no national language; in 15 cantons, including 70 per cent of the population, German is spoken; in 5 cantons, including 22 per cent of the population, French is spoken; and in 2 cantons Italian or Romansh is used. A country whose surface features are so accentuated cannot escape having its whole economic and political life influenced if not actually molded by them.

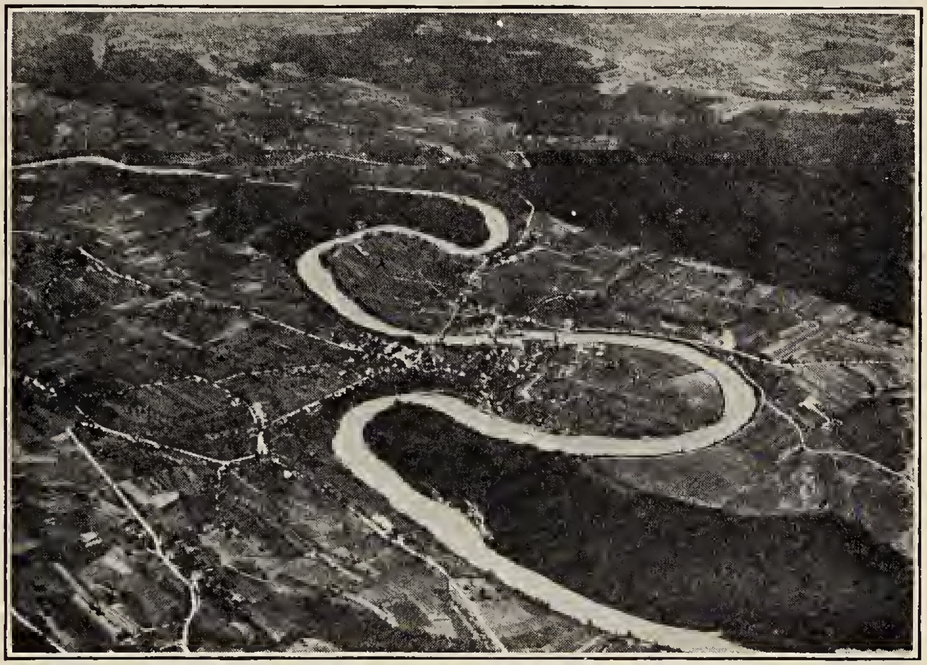


Fig. 239*b*.—The agricultural lands of Switzerland near Zurich, densely populated and highly cultivated. (*Both photos by Swiss Aviation Service*).

Alpine Passes, Roads, and Railroads.—Many of the large rivers of Europe rise in the Alps; these include the Rhone, Rhine, Po, and Danube, flowing west, north, south, and east respectively. The valleys of these rivers are the natural routes for the great railway lines of central Europe, and at the heads of these valleys and of other valleys of the Alps are the passes that have become famous in European history. Over the principal passes perfectly graded roads have been constructed and under six of the passes (not all in Switzerland) railroad tunnels have been built. Three of the tunnels—the St. Gothard (9¾ miles long) and the two Simplon tunnels (each 12¼ miles long) are part of the chief north-south traffic routes of Europe. The presence of fairly easy passes in the Alps has made the mountains a much less serious barrier than mountains like the Pyrenees and Caucasus which are conspicuously lacking in low passes. Furthermore, the situation of the Alps in the heart of Europe makes it far more essential that roads and railroads traverse them. Thus it is that the topography of Switzerland makes road and railway building difficult, but the location of the country makes such building necessary, and the result is favorable to the whole economic life of the republic.

The Importance of Dairying.—The heavy rainfall, cool climate, damp soil, and rugged topography of much of Switzerland make grazing (cattle and goats) the most practicable use for more than half of the usable land. Sheep are raised, but not in large numbers. Especially in the Alpine pastures with their rich growth of summer grass are the well-kept Swiss cattle herded. It is quite customary in summer for the man of the family and perhaps an older son to take the cattle far up into the mountains, live in a temporary hut or cottage, care for the cattle, and make the cheese, while the rest of the family care for the little farm in the valley. Swiss cheese, condensed milk, and milk chocolate are distinctive national products enjoying a world-wide reputation.

The Absence of Minerals and the Shortage of Raw Materials.—Trifling quantities of poor coal and iron are at times mined in Switzerland, but neither these nor any other minerals are of significance. Such a condition has necessarily militated against certain forms of general manufacturing, but it has by no means prevented a remarkable growth of *specialized* manufacturing. There is no other country which is destitute of coal and iron, that has so highly developed its manufacturing industries as Switzerland has done.

The Development of Manufacturing.—Switzerland is one of the four or five countries of Europe in which manufacturing has grown to be a dominant industry, yet it is the most handicapped of them all in its lack of coal and raw materials, and in the cost of securing them. All overseas raw materials must be landed in foreign ports, and be transported over foreign railways. Under such handicaps it is remarkable that the Swiss can succeed as a manufacturing nation. The reason lies in the characteristics of the people; in their mechanical ability, in their liberal government, in their six universities, their excellent technical and vocational schools, and in their ability and willingness to live on a small income. They probably could not compete with more favored nations if they did not follow the course of making goods in which the cost of power and raw materials is a minor matter and the cost of human labor a major one. These goods include watches, clocks, jewelry, musical instruments, optical goods, scientific apparatus, and light machinery; these industries are located especially in the French-speaking cantons and in the cities of Geneva, Neuchâtel, and Berne. For example, 20 million watches and clocks are exported in a year. In Basel and Zurich and other cities mainly along the St. Gothard route, which brings in the raw silk from Italy and the port of Genoa, are some 200 silk mills, large and small, and silk goods form one of the leading items of Swiss manufacture. In the canton of St. Gall are concentrated the cotton, lace, and embroidery interests. The embroidery industry formerly employed 50,000 to 60,000 people, produced 50 million dollars' worth of embroideries in a good year, and dominated the world's markets so far as this product was concerned. Milk chocolate factories employ thousands of workers and send millions of pounds of chocolate yearly to other countries. These are examples of the highly specialized Swiss products which constitute about 80 per cent of the exports of the country.

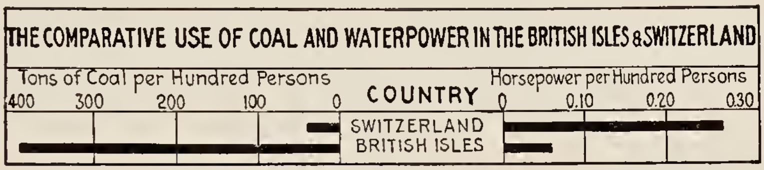


FIG. 240.

The Large Foreign Trade.—In the year of 1927 the foreign trade of Switzerland (with less than 4 million people) reached 870 million dollars, or $225 per capita. This placed the country among the first in the world in per capita foreign trade, and was double the highest figure ever reached by the United States. In a poor year the figures are lower, but they are always high. Most of the exports are the specialized manufactures previously referred to and they are sent to every part of the commercial world, but most largely to the four countries lying on the borders of Switzerland.

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CHAPTER XXVII

THE SCANDINAVIAN COUNTRIES

Historical Interrelations of the Three Countries.—Owing, no doubt, to geographical proximity, the three countries, Denmark, Norway, and Sweden, are peopled by the same racial stock—the Scandinavian—which belongs to the sturdy Teutonic race that occupies northwestern Europe. During the past thousand years two or more of these countries have been at various times united and again separated.

The Physiographic Character of the Scandinavian Peninsula.—The greater part of the Scandinavian Peninsula is an ancient land mass—among the oldest in Europe. The resistant rocks of this old plateau extend into Finland and give that country a similar geological character. Scandinavia was the principal center from which the great European ice sheet of the last glacial period moved outward, and, as a result of the scouring and transporting action of this ice sheet, the highlands of Scandinavia were robbed of most of their soil and are now a jumbled mass of barren or nearly barren mountains. The southern end of Sweden belongs to the great European plain and is fair agricultural land.

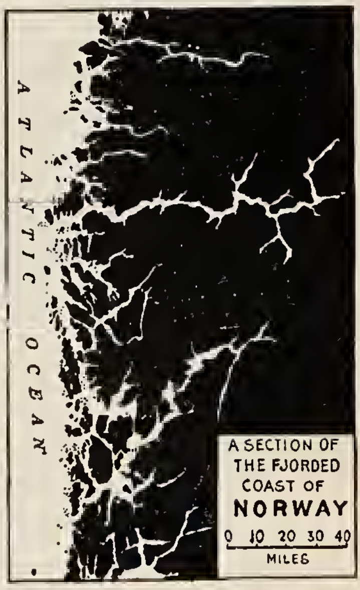


Fig. 241.

Norway

The Influence of the Norwegian Coast upon the Economic Life of the Country.—The mountainous plateau which constitutes the greater part of Norway has heavy rainfall and snowfall which gives the short, swift rivers great erosive power. Moreover, the many valleys leading down to the sea have been much overdeepened by the erosive action of glaciers, and their submerged mouths now form the fiords which give to Norway its remarkable coast (Fig. 241). Besides these long, deep, narrow arms of the sea, some of which reach back into the plateau from 50 to 100 miles, there are almost countless islands (said to be 150,000) fringing the coast. Thus, everything in the physiography of Norway has conspired to make the people a seafaring race.

In the centuries when ocean navigation was in its infancy, when there were no charts of coasts, no lighthouses, no mariner's compass, and only small sailing vessels, an island-fringed coast like that of Norway or of Greece, where the mariner was almost never out of sight of land, was the most favorable place for encouraging seamanship and promoting a maritime life among the coast dwellers. If, in addition, the surrounding waters contained abundance of fish, then a motive for going upon the sea was added. Because of its unproductive land, its deeply indented and island-fringed coast, and the wealth of fish in the off-shore waters, the people of Norway have turned toward the sea to a greater extent than any other European people, the British not excepted.

The Influence of the Ocean upon the Climate of the Norwegian Coast.—Norway is in the same latitude as Greenland, which is a frozen waste covered by ice and snow and almost uninhabited. Yet Norway is one of the enlightened nations of the earth, with modern cities, modern industries, and a population of 2,700,000 people. Throughout its great length of coast, extending far north of the Arctic Circle, the harbors of Norway are not closed by ice even in midwinter, and the January temperature along the coast is as high as it is in southern Russia, 1,500 miles farther south. Nowhere else, unless it be in Iceland, does the very existence of a nation depend upon the climatic influence of the ocean as it does in the case of Norway, and to a lesser degree in the case of Sweden and Finland.

Impossibility of Supporting the Nation by Agriculture.—So thin and scanty is the soil of Norway that on an average only 3½ acres in 100 are used for agriculture; about 22 acres in 100 produce forests (of pine, spruce, and other evergreens) but in most places the stand of timber is not heavy (Fig. 242). Seventy-five per cent of the land is waste. The growing season is necessarily very short, and only hardy grains and root crops can be raised. So rugged and barren is the surface of the country that only little strips of valley land here and there can be cultivated. The farms are small, two-thirds of them not exceeding 5 or 6 acres of tilled land; many of these are only little garden patches at the head of a fiord or in some secluded valley. Oats and potatoes are leading crops but the food production is much below the requirements of the population. In such a land farming is a discouraging enterprise, and this, in part,

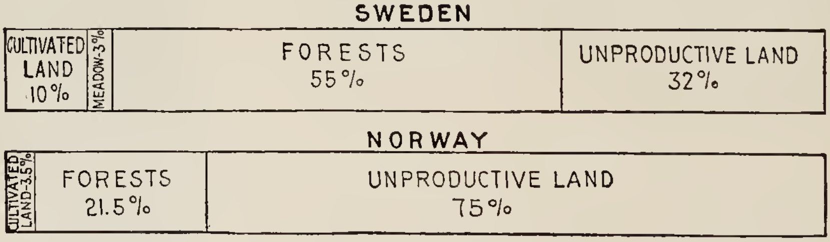


Fig. 242.—Sweden has a much higher proportion of productive land than Norway.

explains the heavy emigration of Norwegians to the United States and also the drift of the men toward the sea. Dairying has increased somewhat and a surplus of dairy products permits some exportation of butter, cheese, and condensed milk. But as a whole, the country must import a considerable part of its food.

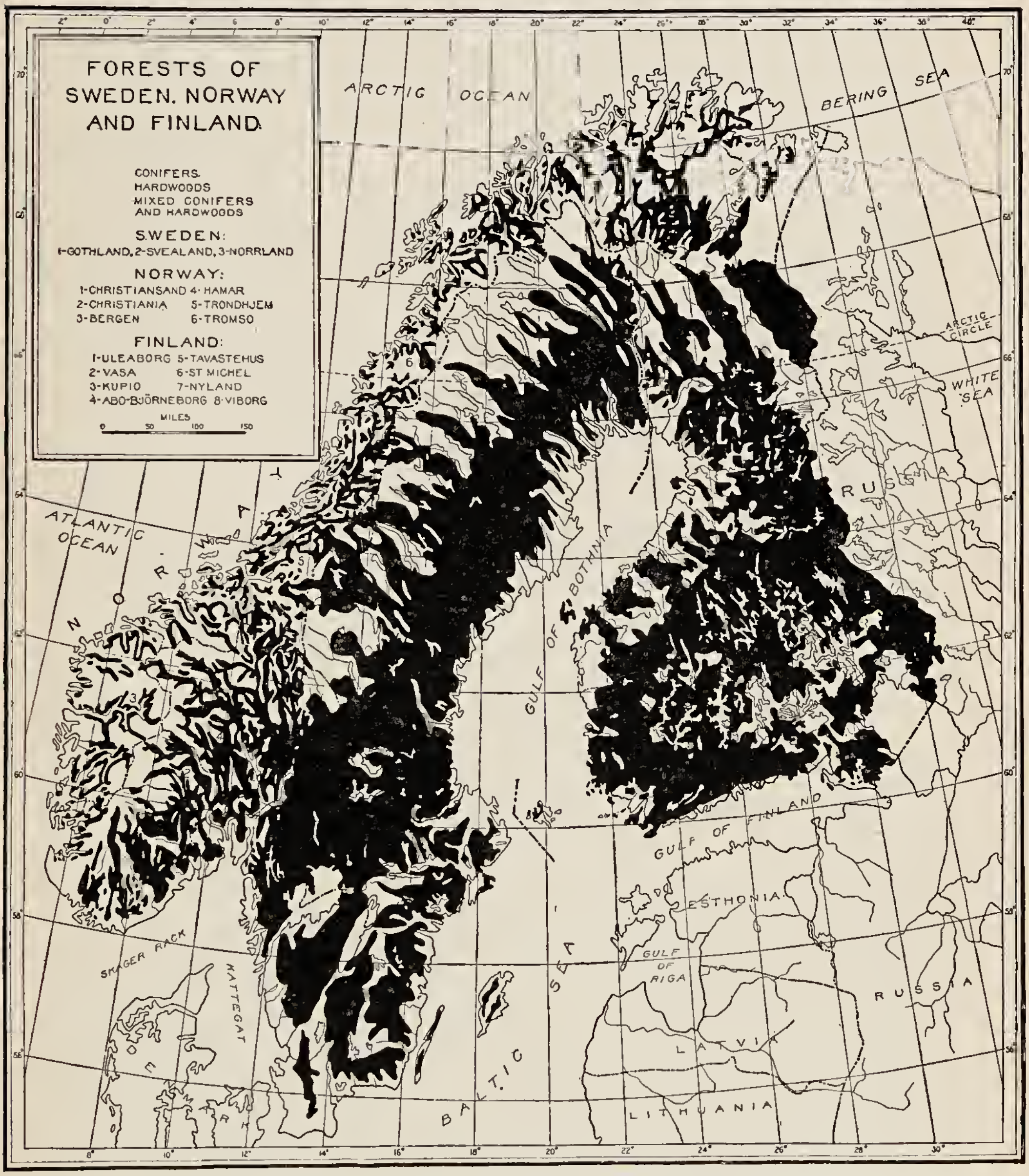

FORESTS OF SWEDEN. NORWAY AND FINLAND
CONIFERS
HARDWOODS
MIXED CONIFERS AND HARDWOODS
SWEDEN:
1-GOTHLAND, 2-SVEALAND, 3-NORRLAND
NORWAY:
1-CHRISTIANSAND 4-HAMAR
2-CHRISTIANIA 5-TRONDHJEM
3-BERGEN 6-TROMSO
FINLAND:
1-ULEABORG 5-TAVASTEHUS
2-VASA 6-ST MICHEL
3-KUPIO 7-NYLAND
4-ABO-BJÖRNEBORG 8-VIBORG
MILES
0 50 100 150
ARCTIC OCEAN
BERING SEA
ARCTIC CIRCLE
WHITE SEA
ATLANTIC OCEAN
NORWAY
RUSSIA
GULF OF BOTHNIA
GULF OF FINLAND
ESTHONIA
GULF OF RIGA
SKAGER RACK
KATTEGAT
BALTIC SEA
LATVIA
LITHUANIA
RUSSIA

FIG. 243.—Areas in black are the lands that are wholly or partly forested. Southern Sweden, for example, has large areas that are partly agricultural land and partly timber land. (*After Zon and Sparhawk*).

Forest Resources and Hydroelectric Power.—Over half of the limited forests of merchantable timber in Norway lies in the southeastern end of the country in the general region of the Swedish border and north of the capital, Oslo (Fig. 243). The manufacture of wood pulp and paper and of various forms of lumber are two of the leading mill industries of the country, but they are much less important than in Sweden whose forest resources greatly exceed those of Norway.

The country has great potential water power (Fig. 202); it is estimated that upwards of 6 million horsepower are capable of commercial development, but less than one-third of it is actually in use and the greater part of this development occurred between 1910 and 1927. By way of comparison it may be pointed out that New York State, which includes Niagara Falls, has about the same amount of developed water power as Norway (Fig. 244). If placed on a per capita basis, however, Norway has more developed water power than any other country. A large part of this power is transformed into electricity and is used in certain special industries which depend upon cheap electric current, including electric smelting of ores and the much more important manufacture of chemicals. Among the latter are compounds of nitrogen made by extracting the nitrogen from the air. This electrochemical industry of Norway is of special interest because it represents an effort to utilize the resource of water power in a country that has very small resources of raw materials. The atmosphere is free and abundant, and if, by the use of cheap electric power, free atmospheric nitrogen can be combined with other substances to make fertilizers or other valuable products, then Norway is making highly intelligent use of her limited resources. The industries of Norway use several times as much water power as steam power, while those of the United States use more than four times as much steam power as water power.

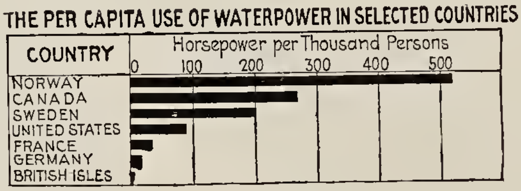


FIG. 244.

Very Poor in Mineral Wealth.—Norway is one of the poorest of European countries in mineral resources; no coal, almost no high-grade iron ore, a very little copper and iron pyrite, and no other minerals worthy of mention.

High Rank in Shipping.—At the outbreak of the World War Norway ranked among the leading nations in its tonnage of merchant ships, being practically on a par with France, Japan and the United States. If reduced to a per capita basis, it led all nations. Though a neutral country during the war, its loss of shipping was exceedingly heavy, amounting to over 800 ships. The Norwegians are among the best sailors of the world and are found as officers and seamen on the ships of many nations. Norwegian ships are primarily engaged in carrying the commerce of other

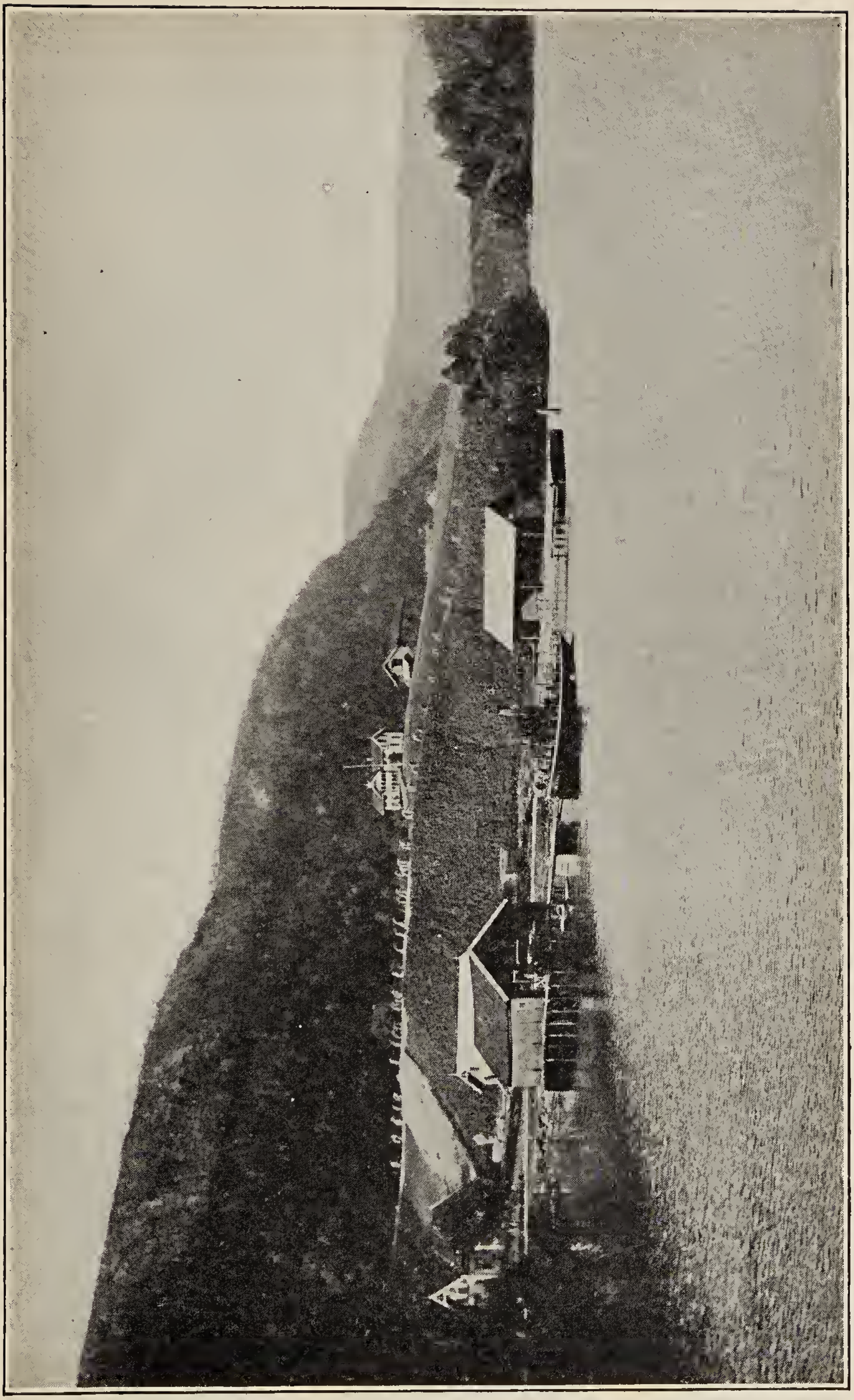


Fig. 245.—Three elements of Norwegian industry: a fishing boat and fish house in the foreground, a small farm on the alluvial terrace, and forests on the lower slopes of the fiord walls. *(U. S. Bur. of Foreign and Domestic Commerce).*

countries, for Norway's commerce itself is not large. It is mainly by the earnings of these ships that Norway is able to offset her unfavorable trade balance, for her imports always exceed her exports in value.

Three Characteristic Exports.—Norway's exports are small, but they reflect with clearness the three chief resources of the country. The three are (1) fish—dried, salted, canned, and pickled; (2) forest products—lumber, timber, woodpulp, and paper; (3) products of the electro-industries—metals, nitrates, and other chemicals.

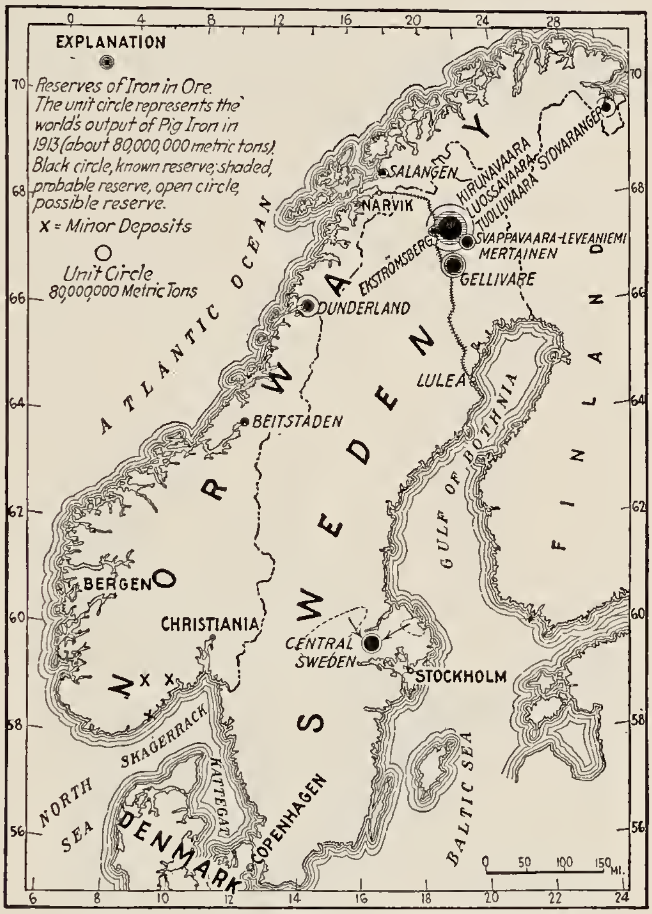
Spitzbergen.—Four hundred miles north of the northernmost part of Norway is a group of islands whose total area is twice that of Belgium or Denmark. Prior to 1919 these islands, in the far-off northern seas, definitely belonged to no one in particular, but that year they were placed under the Norwegian flag by the League of Nations. The islands contain mineral wealth, including coal of good quality, iron, copper, and lead. Since Norway is seriously lacking in minerals, the acquisition of Spitzbergen may prove of genuine value to that country.

Sweden

Natural Wealth Greater than in Other Scandinavian Countries.—Norway and Denmark are poor in natural resources, and the same is true of Finland; Sweden has as much natural wealth as all these three combined. Fifty-five per cent of the land is forested, and a large part of this forest is of good quality (Fig. 243). About 10 or 12 per cent of the land is suited to agriculture (Fig. 242). There are rich deposits of iron ore (Figs. 200, 246)—equal in quality to the best in the world; and the water power resources are among the largest possessed by any European country (Fig. 202). Thus, with an abundance of iron, timber, and water power, and with fair agricultural land, Sweden is equipped to maintain a more varied industrial and commercial life than either of its sister Scandinavian nations.

Unfavorable Geographical Conditions.—Sweden lies far to the north and on the leeward side of the Scandinavian mountains. Most of the country is deeply covered with snow during the long winters; the growing season is short and the summer precipitation is only moderate. The lakes and rivers are frozen, and the water power is greatly reduced during the winter. Only in the southern third of the country is agriculture profitable; yet this southern third could maintain extensive manufacturing industries based upon the raw materials of the country if cheap coal were available, but Sweden has very little native coal. Eventually hydroelectric power may largely make up for this shortage of coal, but it has not yet done so. However, when the natural advantages and disadvantages of Sweden are compared they seem nearly to balance. Unlike Norway whose economic life is so largely maritime, and unlike Denmark which is mainly devoted to specialized animal husbandry, Sweden is not forced to specialize, but is able to maintain a diversified, well-balanced economic life.

The Diminishing Relative Importance of Agriculture.—Two generations ago the people of Sweden were preeminently agricultural, and more people were obtaining a living by cultivating the soil than by all other occupations combined. After the middle of the last century certain important changes came which greatly stimulated the forest industries and iron mining industries, and a little later stimulated manufacturing. Today less than half of the people of Sweden are farmers against 85 per cent a century ago. The hardy cereals—oats, wheat, rye, and barley—and the hardy vegetables—potatoes, sugar beets, and the root crops for cattle feed—make up the larger part of the farm crops. The total population numbers only 6 million (equal to Ohio), yet food has to be imported, although meats and dairy products are exported. The movement of population is toward the cities as it is in all the industrial nations.


EXPLANATION
Reserves of Iron in Ore. The unit circle represents the world's output of Pig Iron in 1913 (about 80,000,000 metric tons). Black circle, known reserve; shaded, probable reserve, open circle, possible reserve.
X = Minor Deposits
Unit Circle 80,000,000 Metric Tons
ATLANTIC OCEAN
NORWAY
SWEDEN
FINLAND
DENMARK
SALANGEN
NARVIK
KIRUNAVAARA
LUOSSAVAARA
TUOLLUVAARA
SYDVARANGER
SVAPPAVAARA-LEVEANIEMI
MERTAINEN
EKSTRÖMSBERG
GELLIVARE
DUNDERLAND
LULEA
GULF OF BOTHNIA
BEITSTADEN
BERGEN
CHRISTIANIA
CENTRAL SWEDEN
STOCKHOLM
SKAGERRACK
KATTEGAT
NORTH SEA
COPENHAGEN
BALTIC SEA
0 50 100 150 MI.
0 4 8 12 16 20 24 28
6 8 10 12 14 16 18 20 22 24
70 68 66 64 62 60 58 56

OUTLINE MAP OF NORWAY, SWEDEN AND DENMARK
SHOWING RESERVES OF IRON IN ORE

Fig. 246.—In the far north of Sweden is one of the most important high-grade iron ore areas in Europe. (*Modified from U. S. Geol. Sur.*)

The Rise of Forest and Wood-working Industries.—A Swedish economist has declared that the future of Sweden lies in her forests. These forests of pine, fir, and spruce occupy the major part of the country and nearly all of the northern half. The longer slope on the east side of the Scandinavian mountains gives rise to a great number of rivers which are excellently suited to the floating of logs. There are more than a hundred such rivers and they and their tributaries penetrate every part of the forest belt and greatly facilitate the movement of logs down to the coast where modern saw mills cut them up, and from their own docks load the lumber and timber upon seagoing vessels. The heavy snows in melting produce the floods which carry the enormous log drives, and single rivers transport from 8 to 14 million logs annually. Owing to the natural facilities for the lumbering industry, Sweden has become the foremost wood-exporting country (Fig. 247), and Great Britain is the largest buyer of these products.

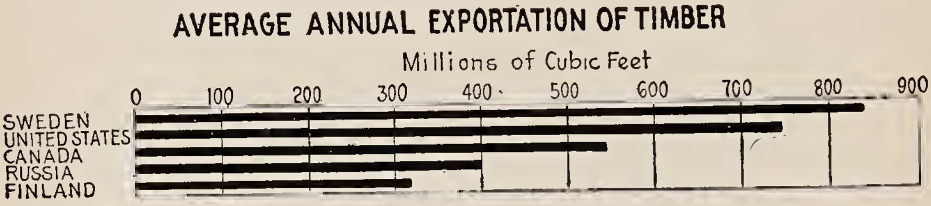


Fig. 247.

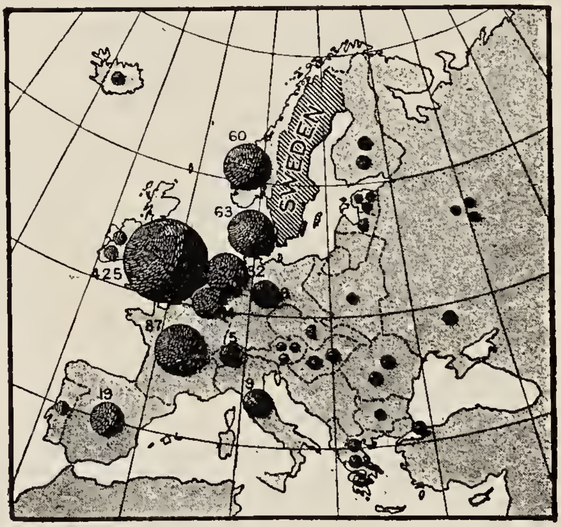


Fig. 248.—Destination of wood products exported from Sweden to European countries. Size of balls in proportion to value of annual exports. (*Swedish Traffic Assn.*)

A great deal of the timber of Sweden, as of cold lands generally, is better suited to woodpulp than to lumber. Small, inferior trees that would not make lumber may be entirely suitable for pulpwood. Sweden, with some 250 pulp mills and paper mills, is one of the foremost exporters of these products, even sending pulp and paper to the United

States. For this industry Sweden is especially well fitted, for it has raw material, water power, nearness to the sea, and nearness to the great consuming markets of Europe. Two other forest products are important: (1) tanbark for some 200 tanneries; and (2) charcoal for fuel and for the smelting of iron ore. The match industry of Sweden is another that is based upon wood resources; Sweden has a factory that turns out 40,000 boxes of matches an hour. There is no other country except Finland whose prosperity is so largely based upon its forest products as is the case in Sweden (Fig. 247).

The Iron Ores and the Steel Industries.—Sweden was once the leading iron-producing country of Europe. Iron ores of high quality have been mined in south central Sweden and have been smelted with charcoal for centuries. The steel thus produced has no superior for certain purposes; for example, the cutlery industry of Sheffield, England, is based upon Swedish charcoal steel. In the far north of Sweden, beyond the Arctic Circle, are the largest high-grade iron ore bodies of Europe (Fig. 246). In fact, over 90 per cent of the known *high-grade* iron ore of that continent is located there, and the rest is in Russia. The ore is at the surface of the ground and is easily mined; in winter a railroad takes it to an ice-free port on the Atlantic coast of Norway, and in summer to a port on the Swedish coast on the Gulf of Bothnia which is frozen over in winter. Without coking coal with which to smelt the ore, Sweden is forced to export most of it, and Germany is the chief buyer, using the ore in her great metallurgical industries in the Rhine-Ruhr basin. The Swedish government is opposed —and properly so—to the unlimited exportation of these raw ores, for the country derives but small return from the ore thus disposed of. It is, of course, desirable on the part of any country to work up its raw materials into manufactured goods as fully as possible, for only thus does the country itself derive a full return from its natural wealth. Moreover, the Swedish steel industry is constantly struggling against the competition of German steel, which is partly made from Swedish ores. Yet the metal industries now exceed the wood-working industries in value of product, and the two together make up about 80 per cent of the value of Sweden's exports.

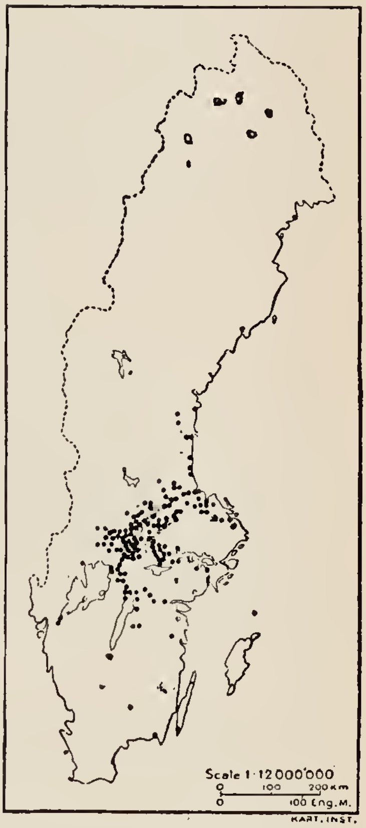


Fig. 249.—Iron works in Sweden. (*Swedish Cart. Inst.*)

The Importance of Water Power.—The almost complete absence of coal in Sweden makes water power of unusual importance (Fig. 202). The amount theoretically available is very large, but the "amount worth exploiting" is placed at about 3½ million horse power, only one-third of which is yet developed (Fig. 250). This is somewhat less than the amount developed in Norway, with its enormous electrochemical factories. Of all the mechanical energy used in Sweden, two-thirds is derived from water power. At present this is most largely developed in south and central Sweden and notably along two rivers, the Dal with about 50 water power plants and the Gota with about 25. The more rigorous climate of Sweden as compared with that of the coast of Norway places the water power plants of the former at a certain disadvantage in competitive industries such as the electrochemical industries. But Sweden's vastly greater wealth of raw materials—especially iron and wood—are in that country's favor. A project has been completed providing for the transmission of hydroelectric power by marine cables from Sweden and from Norway to Denmark which has neither coal nor water power. In looking ahead to the future development of Sweden, it is evident that its water power is destined to play a very large part.

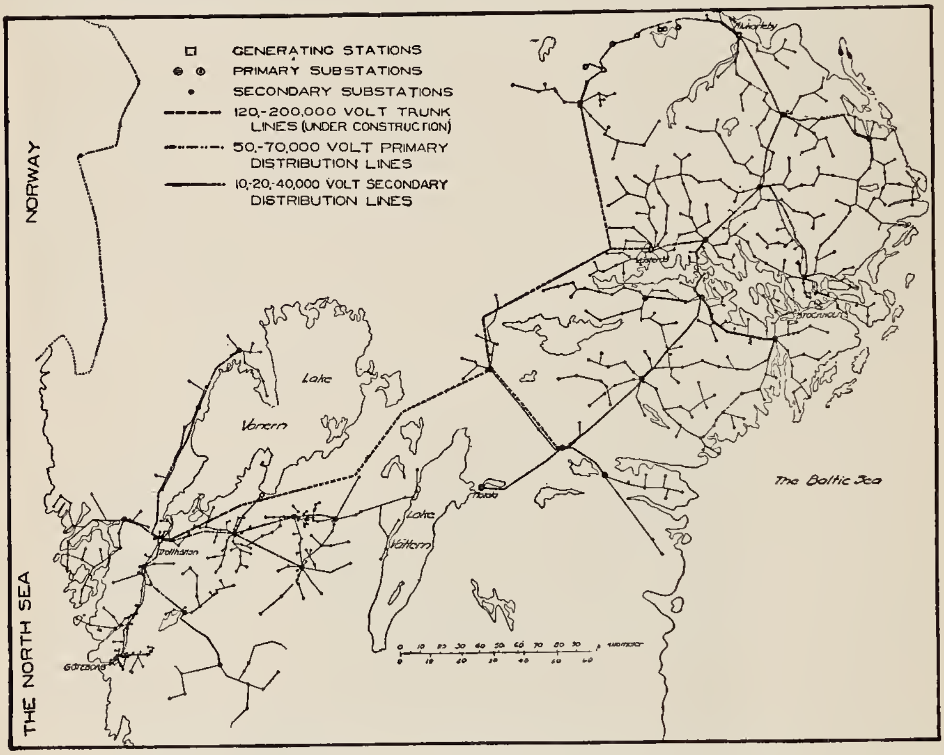

□ GENERATING STATIONS
● ◉ PRIMARY SUBSTATIONS
• SECONDARY SUBSTATIONS
120,-200,000 VOLT TRUNK LINES (UNDER CONSTRUCTION)
50,-70,000 VOLT PRIMARY DISTRIBUTION LINES
10,-20,-40,000 VOLT SECONDARY DISTRIBUTION LINES
NORWAY
THE NORTH SEA
Lake
Vanern
Lake
Vättern
Trollhättan
Göteborg
Motala
Stockholm
Alvkarleby
The Baltic Sea
0 10 20 30 40 50 60 70 80 90 kilometer

Fig. 250.—Electric power lines in south central Sweden.

Notable Increase in Manufacturing.—The lumber, timber, pulp, paper, and metal industries have already been discussed. In the last quarter-century Sweden has had a rapid growth in general manufacturing

—cotton, woolen, flour, tobacco, shoes, chemicals, beet sugar, butter, and many other products. In 1840 only 10 per cent of the people of Sweden depended for a livelihood upon manufacturing and commerce; today the figure is over 50 per cent, or as high as the percentage in France.

Transportation and Commerce.—Sweden has a larger railway mileage in proportion to population than any other country in Europe. It also has a number of much used waterways in the southern quarter of the country, which has the major part of the population, agriculture, and manufacturing. A waterway with a minimum depth of 9 feet extends entirely across the southern end of the peninsula and connects the chief port, Göteborg, with the capital, Stockholm. This waterway makes use of two large lakes (Vener and Vetter), and along its course are many of the industrial plants of the country.

The foreign commerce of Sweden usually reaches $800,000,000 a year, but dropped much below that figure in the years of depression following the World War. Imports equal exports, and both are extremely varied in character, the imports including as two large items coal and manufactured articles. Manufactures of wood and steel and several million tons of iron ore make up 80 to 90 per cent of the exports.

DENMARK

Denmark's Limitations.—It is pointed out elsewhere that each of four small countries of western Europe has worked out the main features of its economic life in a characteristic way. Each finds itself compelled to take the fullest possible advantage of its geographical location and to make the most intelligent use of such resources as it possesses. The struggle for economic survival is severe in these countries because of their small size and consequent small natural resources; they must import much of their food and raw material, and must in some way earn the money with which to pay for them.

Denmark is one of these countries; it is a flat, sandy country with no coal, iron, or other minerals. It has almost no forest resources and produces very few raw materials that can be worked up into manufactured goods. Its location for conducting *entrepôt* or transit trade has not proved to be so favorable as that of the Netherlands or Belgium. With generous fertilization and intelligently directed labor, the soil is made highly productive, but Denmark can not successfully produce miscellaneous farm products for export in competition with Canada, the United States, or similar countries. If the country is to depend upon agricultural exports, they must be specialized products and, furthermore, they must be such as are demanded by nearby markets; this is the course that the Danes are following.

Specialization in Dairying.—Fifty or sixty years ago Denmark was trying to maintain its people mainly by general agriculture, including wheat raising, but the country was distressingly poor, and thousands sought relief by emigrating. The soil was run down and the yields per acre were small. During these same years, the city population of England was rapidly growing and the demand for imported farm products was also growing. Among the products much in demand were butter, eggs, and bacon. Gradually the Danish farmers, under the influence of far-sighted leaders, began the study and practice of specialized dairying (Fig. 251). Better cows were selected; more and more of the land was devoted to clover, root crops, and succulent forage crops, and thereby larger quantities of milk-producing feeds were raised on a given area of land. Cooperative dairies and cooperative buying-and-selling organizations were formed all over Denmark. Experimental stations, special agricultural schools, and the distribution of printed matter among the farmers, steadily raised the level of farm practice, and gradually the soil and dairy herds of Denmark, under intelligent management, yielded larger returns. Prosperity replaced poverty; Danish butter became famous in the London market for excellence and dependability, and commanded from 2 to 5 cents a pound more than butter from other countries. So thorough was the inspection of this product by the cooperative marketing agencies that inferior butter under the Danish brands was almost unknown. Under this régime, fertility was steadily returned to the land; profits permitted the importation of oil cake, American corn, and other feeds, which in turn increased the milk and meat production of the country. In recent years Denmark has exported about 300 million pounds of butter yearly, and 70 per cent of it goes to Great Britain, the world's largest importer of dairy products. It was a triumph of intelligence, integrity, and cooperation in making the most of the country's opportunities.

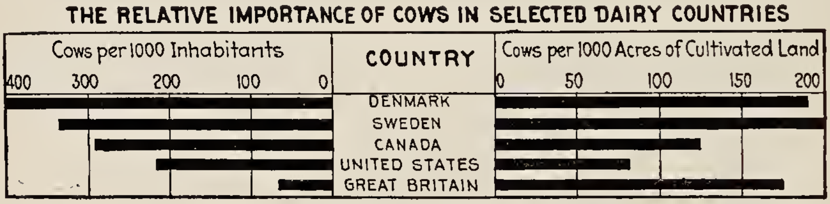


FIG. 251.

Other Aspects of Danish Agriculture.—Denmark is a country of small land holdings, and about 90 per cent of them are occupied and operated by their owners. Tenancy—which leads to the depletion of the land—is rare. Education is widespread; in addition to rural elementary schools, there are over 100 rural high schools, and over 20 agricultural colleges in a little country one-third the size of New York. Not only did Denmark develop her dairy herds and her soil, she went to the foundation of prosperity and developed her common people, more than half of whom live on the farms.

An outgrowth of dairying in Denmark is the raising of pigs, for the skimmed milk has value as a feed, and this milk is made the basis of an industry scarcely less important than butter-making—namely, the production of high-grade pork from which are made the famous Danish bacon and hams that bring top prices in the British market. To complete the Londoner's breakfast, the Danes have also turned to poultry raising and they send London 3 or 4 million dozens of eggs monthly. By these intensive, intelligent methods, the land of Denmark annually exports from $30 to $35 worth of products for every acre—a figure attained by no other agricultural country. The value of *agricultural* exports per capita of the population in Denmark in 1928 was much greater than the per capita value of *all* exports from the United States in that year.

Commerce.—Copenhagen, the capital and chief city, is situated on the largest of the many islands that form a part of Denmark. It occupies a strategic commercial position between the North Sea and the Baltic. Most of the Baltic ports have rather shallow water, and Copenhagen, with its deep waters and "free port," acts as a collecting and distributing center for this entire region. The hinterland of Denmark, unlike that of Netherlands and Belgium, is only the small home country, and its exports are therefore very largely the home products. Denmark is a large buyer of American cottonseed meal, and automobiles. But the United States buys only a trifling amount from Denmark, mainly because the United States produces a sufficiency or a surplus of the same products.

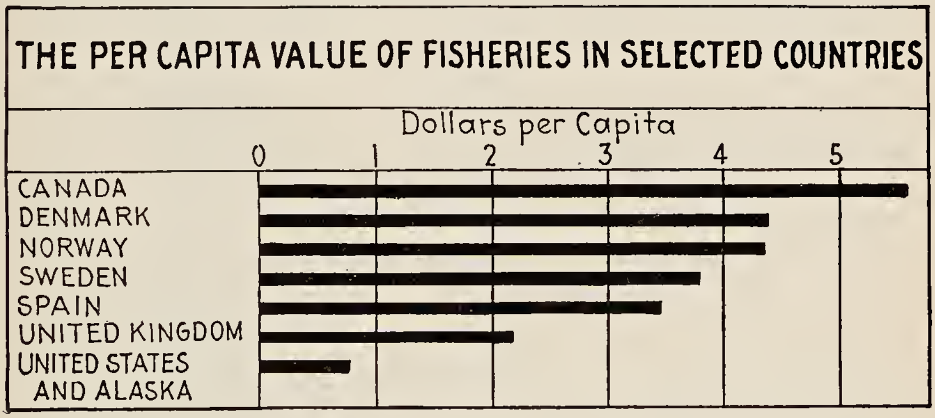


FIG. 252.

Iceland.—For centuries, Iceland was treated as a colony or dependency of Denmark, as Greenland still is. This little-visited island on the border of the Arctic Sea is rendered habitable by the mild waters and winds of the North Atlantic. It contains about 100,000 people, mostly of

Scandinavian ancestry. Since 1918 it has been an independent nation, but accepts the King of Denmark as its sovereign. The fisheries off the Iceland coast are frequented by the fleets of most of the north European countries. The largest industry of the island and the one to which its climate is well suited is sheep raising. It has a capital city with highly educated people, a university, a national library, 40 newspapers and periodicals, and the refinements of civilization. This small island has at times exported products valued at 3 or 4 millions of dollars a year.

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CHAPTER XXVIII

FINLAND, POLAND, AND THE BALTIC STATES

Finland

The Country and the People.—As a whole, Finland is the most northerly of civilized countries (Fig. 253). Considerably larger than the United Kingdom, it has less than 3½ million people. It is a cold, rocky, country with one-third of its area covered with glacial lakes and swamps, and thousands of square miles covered with infertile glacial deposits. The northern portion lies beyond the Arctic Circle and has only about one inhabitant to the square mile. Less than 10 per cent of the land is cultivated or pastured (Fig. 254), but even this is higher than the proportion in Norway. The winters are, of course, long and cold; the growing season is short; forests and brush cover the greater part of the land, and large areas are almost uninhabited. In a country of so few natural attractions it is surprising to find a people of high culture, maintaining an excellent school system, supporting 350 newspapers and periodicals and numerous learned societies, and maintaining a high level of intellectual

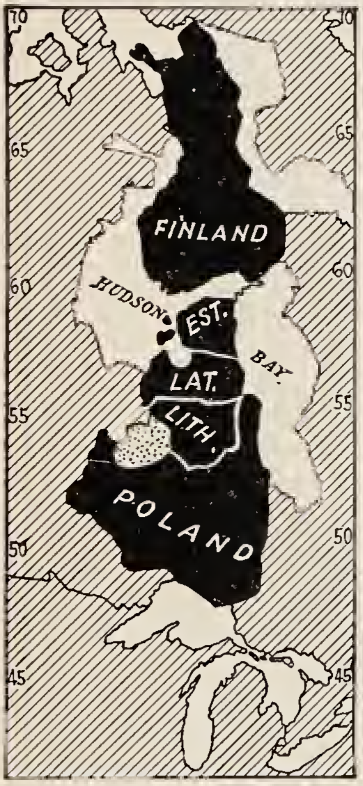


Fig. 253.—Five of the new countries of Europe drawn to bring out their respective areas and latitudes in comparison with a portion of North America.

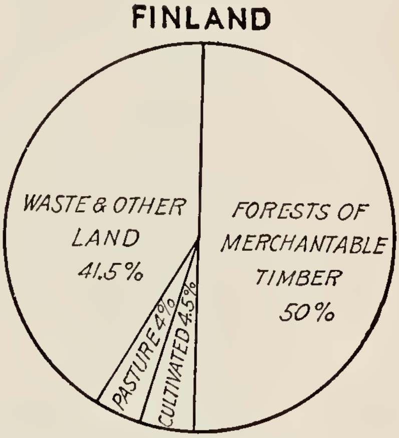


Fig. 254.—Showing the principal uses of land in Finland.

and social life. The Finns themselves are descended from Mongolian ancestors who came into the country long ago. For 500 years they were under Swedish rule; large numbers of Swedes settled in the coastal belt of the country, and they have largely dominated the culture of the whole population. To them Finland owes much of the intellectual and economic advancement that it has achieved.

In 1809 Russia took the Grand Duchy of Finland away from Sweden and during the following century attempted its Russianization, but the effort failed. The national spirit of the Finns is intense; they bitterly resented Russian control, and, following the Russian Revolution of 1917, declared their independence and set up a republic with its capital at Helsingfors, the largest city.

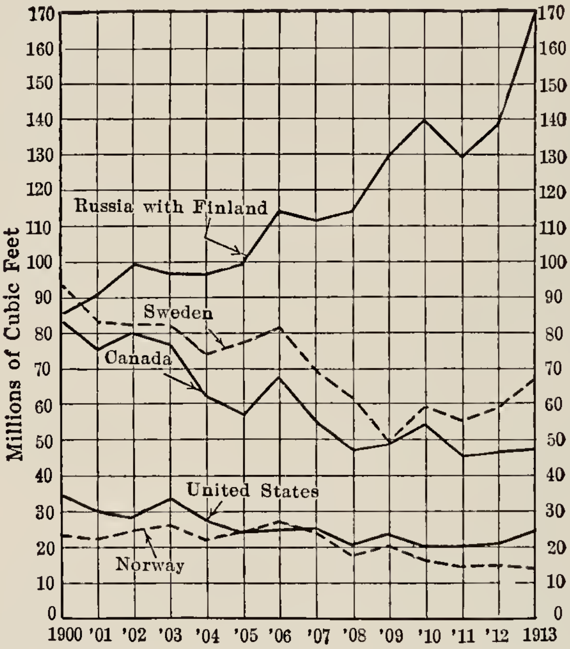


Fig. 255.—Quantities of sawn lumber imported into the United Kingdom from various countries. (*From Zon and Sparhawk's Forest Resources of the World*).

Resources and Industries.—Geologically Finland is made up of one of the oldest formations on the earth, an ancient land mass upon which the agents of waste have worked for uncounted ages, resembling in this respect the Laurentian upland of Canada. The rocks contain no coal, little workable iron, and almost no other minerals of economic value. Only hardy grains, potatoes, root crops, and hay can be grown on a commercial scale and not enough of these to supply home needs. The chief wealth of the country lies in its forests of pine and spruce, a continuation of the Swedish forests on the west and of the Russian on the east. Lumber, timber, pulpwood, and paper are the most important exports, forming about 90 per cent of the value of all exports (Fig. 255). The

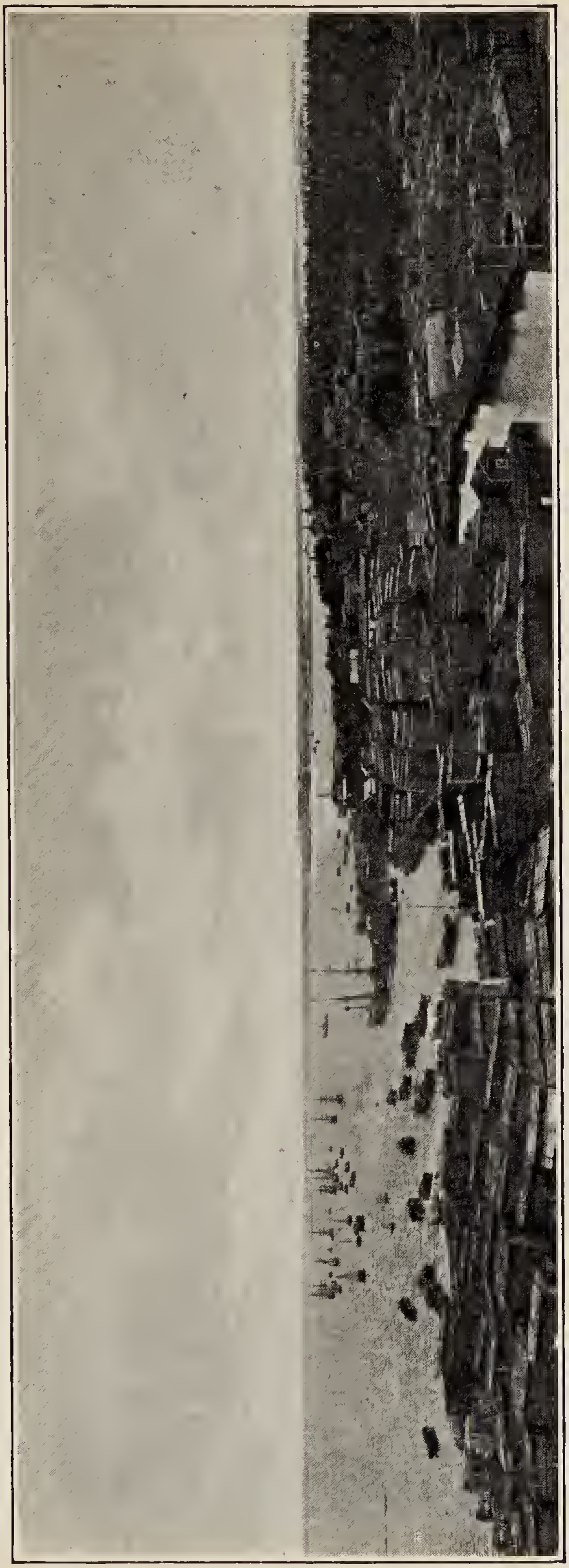


Fig. 256.—A lumber port on the coast of Finland. The low, forested surface of the country yields a surplus of timber for export and large saw mills are found on the coast. (*U. S. Bur. Foreign and Domestic Commerce*).

pulp and paper industry, is second only to lumber and timber products among the few manufacturing industries of the country.

Agriculture and dairying employ the majority of the people, nearly one-half of whom are poorly paid agricultural laborers. Dairying has become increasingly important. Hundreds of cooperative butter factories have been established and butter is the largest agricultural export of the country, going mostly to Great Britain.

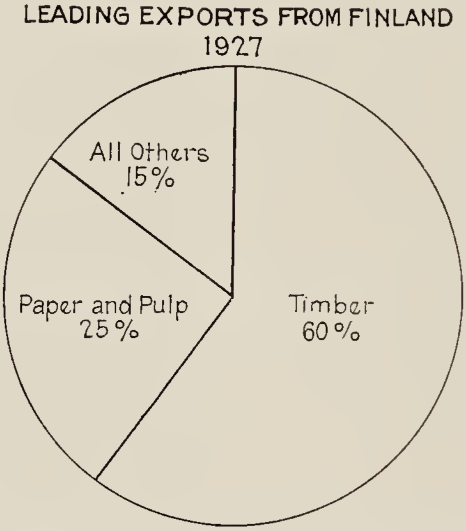


Fig. 257.—Forest products make up nearly nine-tenths of the exports of Finland.

Poland

Poland in the Past.—Poland lies in the middle of the great European plain, between two strong and aggressive nations—Russia and Germany. In the seventeenth and eighteenth centuries it was one of the powerful nations of Europe with a national domain which at its maximum stretched almost the entire distance across Europe from the Baltic to the Black seas. But it suffered from certain weaknesses which led to its overthrow and finally to its partition and the annexation of its territory to Russia, Prussia, and Austria (in 1772 to 1795). The serious weakness of the country lies (1) in its proneness to internal strife, (2) in the lack of a stable, land-holding middle class, and (3) in the absence of natural boundaries. Lying as it did, and still does, in the midst of a plain, its own people have filtered into the surrounding countries and the surrounding peoples have filtered into Poland. Nowhere is there any distinct racial or linguistic boundary. The fact that for more than a century a part of the Poles were ruled as Russians, a part as Austrians, and a part as Germans has made it easy for all of these peoples to move about until definite nationalistic borders disappeared and miscellaneous mixing of races resulted. No other nation has such a serious problem in this respect as has the new Poland that is attempting to rebuild itself out of parts regained from the three wrecked empires of Europe.

The Present Polish Territory.—The present boundaries of Poland are not acceptable to the various countries involved, and may at any time lead to trouble. By the treaty of Versailles (1919) a narrow strip of land—a Polish corridor—extending from the main body of Poland to the Baltic Sea, is placed under Polish control, and the city of Danzig, at the seaward end of this corridor, is made a free port which Poland may use for its ocean commerce. This connection with the sea provides a condition that is almost essential to the economic life of the nation.

As now constituted, Poland is the most populous of the new countries that arose from the World War. It is more than three-fourths as large as Germany, though its population is only about 28 millions. It is in the fullest sense a buffer state erected between Russia and Germany at the desire of the allied powers, and especially at the desire of France. It is a region of intermingled agricultural land, forests, and marshes, occupying almost the entire basin of the Vistula River. Nearly half of the land is cultivated. The climate is continental, with sufficient rainfall for all crops; the summers are rather hot; the winters are cold with heavy snows. The position of the country between agricultural eastern Europe and industrial western Europe has caused it to partake of the character of both, though agriculture is the more important.

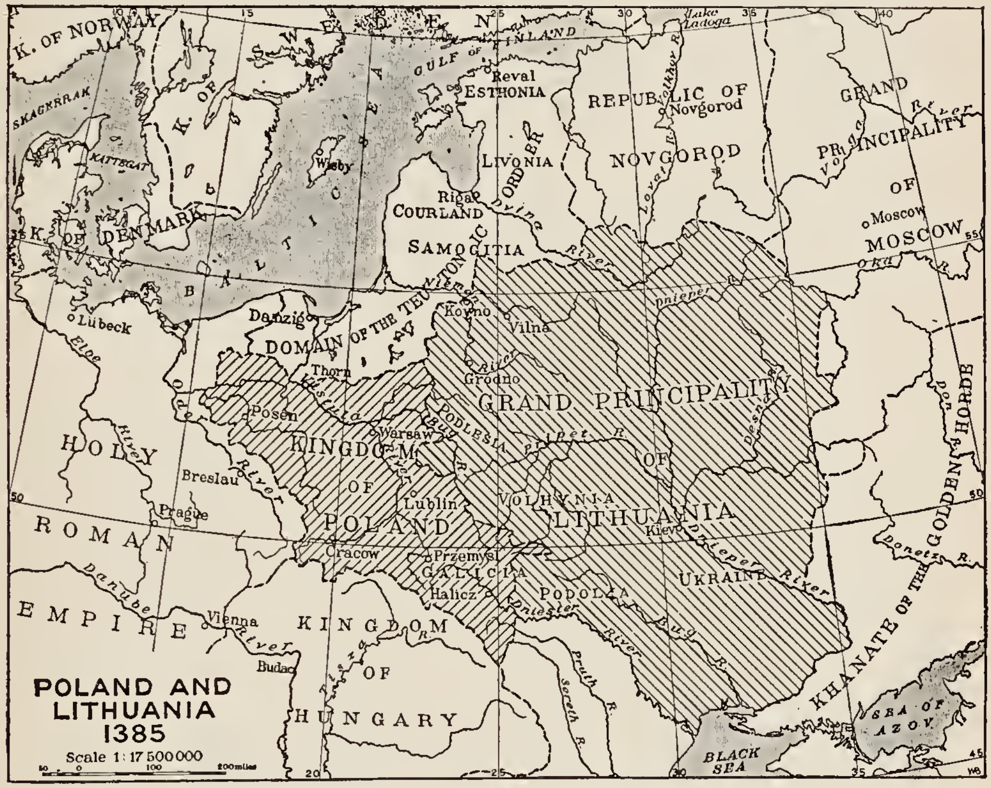

POLAND AND
LITHUANIA
1385
Scale 1:17 500 000
K. OF NORWAY
SKAGERRAK
KATTEGAT
K. OF DENMARK
SWEDEN
GULF OF FINLAND
Reval
ESTHONIA
Wisby
LIVONIA
Riga
COURLAND
SAMOGITIA
REPUBLIC OF NOVGOROD
Novgorod
Lake Ladoga
GRAND PRINCIPALITY OF MOSCOW
Moscow
Oka
Lübeck
Elbe
Danzig
DOMAIN OF THE TEUTONIC ORDER
Thorn
Kovno
Vilna
Niemen
Grodno
GRAND PRINCIPALITY OF LITHUANIA
Dnieper
Posen
Warsaw
KINGDOM OF POLAND
PODLESIA
Pripet R.
Lublin
VOLHYNIA
Kiev
Breslau
Prague
HOLY ROMAN EMPIRE
Danube
Vienna
Budapest
Cracow
Przemysl
GALICIA
Halicz
PODOLIA
Dniester
UKRAINE
Dnieper River
Bug R.
KINGDOM OF HUNGARY
Pruth R.
Sereth R.
KHANATE OF THE GOLDEN HORDE
Don R.
Donetz R.
BLACK SEA
SEA OF AZOV

FIG. 258.—In the 14th century Poland and Lithuania were united and formed one of the great nations of Europe. (*From the Geographical Review, published by the American Geographical Society of New York, Vol.* 4, *p.* 14).

Agriculture.—Occupying a plain in an intermediate latitude and receiving 25 inches or more of rainfall annually, Poland is quite naturally a farming country. Its surface shows the results of the continental glaciers that covered it during the last glacial epoch, for there are poorly drained areas and rough moraines as well as broad stretches of excellent agricultural land. The country suffered repeated devastations during the World War, for it was fought over again and again; few if any parts of Europe suffered such appalling losses of people and property. The country lies in the very heart of the rye-potato-sugar-beet belt of central Europe. Wheat, oats, barley, and flax are grown, but rye is the leading cereal, as it is in the sandy lands of Prussia and Russia on either side (Figs. 197 and 283). As in Germany, potatoes are raised not only for human food but for the manufacture of alcohol, and as a feed for farm animals (Figs. 232 and 234). Agricultural methods differ in different parts of the country depending upon whether the particular region was formerly under Russian, German, or Austrian control; Russian Poland is the most backward and German Poland the most advanced. The land problem has been a troublesome one for centuries, owing to the fact that the major part of the land has been held in large estates owned by the landed aristocracy. It was reported that in 1914, less than one-tenth of 1 per cent of the people owned 40 per cent of the land. Such a condition almost inevitably resulted in a large landless class that is discontented and always ready for rebellion. Most European peoples have long had this land problem to face and it still is a cause of serious discontent in several European countries besides Poland.

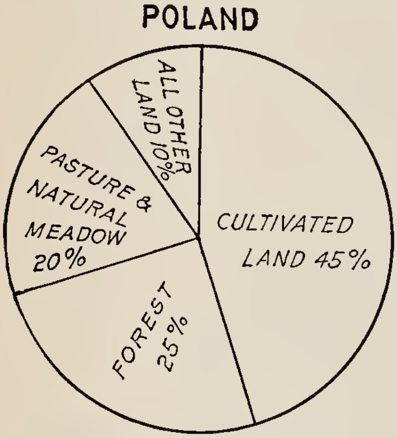


Fig. 259.—Showing the principal uses of the land in Poland.

The raising of cattle and swine which is such an important phase of agriculture in Germany, is important in German Poland, somewhat so in Austrian Poland, and least so in Russian Poland. Poland is to be thought of as primarily an agricultural country, capable under normal conditions of producing the food that its own population demands (Fig. 259).

Large Forest Resources.—Approximately 25 per cent of the land of Poland is forest covered, and forest products constitute significant items in the exports of the country. The forest industries are by no means so important as they are in Sweden and Finland, nor are the forests so scientifically managed as they are in Germany or Switzerland, yet they supply fuel, lumber, and pulpwood for home needs and for export. The forests are distinctly an element in the national wealth.

Large Mineral Wealth.—The extreme southeastern corner of Germany was known as Upper Silesia. It is quite largely occupied by Polish-speaking people, but the industries have been mainly in German hands. It is a densely populated highly industrialized section because of the mineral wealth that the region possesses. In the settlement that followed the World War, the greater part of this mineral land was awarded to Poland. Moreover, the territory taken from Austria and restored to Poland also is rich in minerals, including petroleum. Thus Poland has become possessed of one of the valuable mineral regions of Europe (Fig. 260). It includes coal fields with great reserves, though they are not of coking quality. It includes the most productive zinc mines in Europe, which are among the most productive in the world. It includes one of the three principal oil fields of Europe; and the salt mines nearby contain almost inexhaustible stores of salt. The iron deposits are not particularly valuable, and the better grades of iron ores must be imported. It will be seen that Poland is remarkably well endowed with minerals, a fact of large significance in the future of the country.

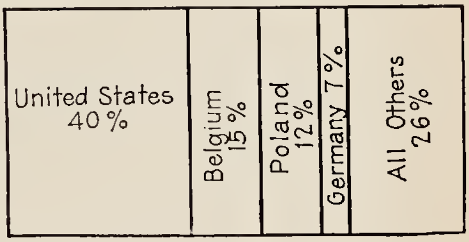
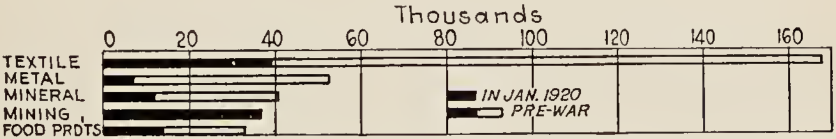


FIG. 260.—Proportion of the world's output of zinc produced by Poland and the other leading countries. (1928.)

Manufacturing Industries Well Developed.—Owing quite largely to the mineral wealth of the region and to German capital and initiative, important manufacturing industries had grown up in Poland before the World War. Of these, the textile industries, centered especially in Lodz and Warsaw, are the largest and employ nearly 40 per cent of the industrial workers (Fig. 261). The great cotton mills of Lodz gave that city the name of "the Manchester of Poland." Woolen, linen, and jute manufactures are also prominent. Next in importance are the metal-working industries, employing 20 per cent of the industrial workers. The large oil refineries (in Galicia) are said to be mainly controlled by British capital. The wood-working industries are widely scattered throughout the country. Russian Poland was one of the chief industrial sections of the old Russian Empire. Russia imposed a high tariff on imported manufactures, especially on textiles. This tariff shut out German as well as other foreign goods and led to the building of textile



NUMBER OF INDUSTRIAL WORKERS IN LEADING INDUSTRIES IN POLAND

FIG. 261.

factories in the part of Poland nearest Germany by German manufacturers who thus got the benefit of cheap Polish labor and escaped the high Russian tariff. The relatively advanced stage already reached by manufacturing in Poland is another element of national strength, and aids in giving to Poland the degreee of economic self-sufficiency which is so much desired by nations. However, the very large proportion of the manufacturing that is controlled by Germans may cause trouble at some future time.

Commercial Opportunities.—Poland has a dangerous military position but an advantageous situation for trading with eastern and southeastern Europe. Lying between the parts of Europe which are dominantly industrial on the west and agricultural on the east, Poland holds a strategic position. With large reserves of coal, well-developed manufactures, access to varied raw materials and to the markets of Russia, Rumania, and Hungary, Poland is in a position to build up an ever-increasing commerce between eastern and western Europe, provided of course that high tariff barriers are not erected.

The Future.—In spite of the advantages in Poland's favor, the country's future is uncertain. Its financial condition is extremely strained; its people are divided, and include radical and quarrelsome elements. Among the Poles are many able leaders; the general level of education is fairly high, and the people are normally industrious and thrifty. France will do all it can to assist Poland, because France desires a strong, friendly nation (an ally if possible) on Germany's eastern frontier. On the whole, Poland has much that should make for success in her struggle for national existence and also much that endangers that success.

The Three Small Baltic States

During its centuries of expansion, the old Russian Empire absorbed many peoples that were not Russian. With the break-up of Russia in 1917, followed by the allied victory in the World War, movements began among the submerged peoples of Russia which resulted in the establishment of three small republics—Estonia, Latvia, and Lithuania—on the eastern shore of the Baltic Sea (Fig. 273). These former Baltic provinces of Russia were at one period under the rule of certain orders of Teutonic or German Knights, and a large part of the land became the estates of the later German barons who largely dominated these provinces down to the present. While the German barons formed only 1.5 per cent of the population, they formerly controlled practically all commercial, political, and industrial activities because of their education, wealth, and aggressiveness. Over 80 per cent of the people are peasants living mainly by agriculture, yet 1.5 per cent of the population formerly owned 60 per cent of the land. After the establishment of the independent

Baltic republics, many of the large landed estates were acquired by the governments, and were divided into small holdings and sold to the peasants. All the Baltic states are distinctly agricultural. The land is partly forested, partly pastured, and partly cultivated in an indifferent way. Educational opportunities were much better in the Baltic provinces than in Russia proper, and four-fifths of the people are able to read and write. Roads are poor, railroads few, wages low, poverty widespread, and life generally an up-hill struggle. Under such a régime, the people produce relatively little beyond their own needs and foreign trade remains small.

Estonia, the northernmost of the three Baltic republics, is one-third the size of Pennsylvania and has an eighth as many people. The Esths are close kin to the Finns and have been considerably influenced by Swedish culture. The boundaries of the country are so placed that 93 per cent of the inhabitants of the country are Esths, nearly all of whom have some education. The school system—including elementary and high schools, commercial and technical schools, normal schools, and a state university—is far ahead of the school system of Russia proper. Only a quarter of the total area is under cultivation, raising rye, barley, potatoes, hay, and flax. The forests, like those of Finland and north Russia, are mainly evergreen and supply some timber and pulp wood for export. Dairying is general and butter is exported. But, on the whole, Estonia, is qualified to take a very small part in international trade or international affairs. Without mineral resources, or any advantages for the development of manufacturing, with a severe climate and a small population, Estonia seems to have little out of which to build a modern nation.

Lativa, like Estonia, came into existence as an independent nation as a result of the World War. The Letts are not a Slavic people, and they have little in common with the Russians. Their country is half the size of New York State and has nearly 2 million people. The Letts are an able people, much more eager for education than the Russians, and are already maintaining a state university that enrolls over 3,000 students. Agriculture, cattle raising, and lumbering occupy the greater part of the people, although Riga, the largest city, is a manufacturing center and seaport of importance. Next to Petrograd, Riga was the principal Baltic port of Russia, and is now the chief port in this part of the Baltic region. Latvia is included in that part of the Russian plain that raises great quantities of flax, and both the fiber and the seed are leading exports of the region. These two articles, butter, and forest products constitute nearly three-fourths of the value of Latvian exports.

Lithuania.—During a part of the fifteenth and sixteenth centuries, Lithuania was one of the large and powerful nations of Europe. Later, it fell under Russian and Prussian rule and was incorporated within those countries, but mainly in Russia. The country is about half the size of

Ohio, and has a third as many people (2.3 millions). The greater part of the people are farmers of the peasant type who suffered from the blight of Russian rule. Like all this part of the European plain with its dominantly light soil, rye, oats, and potatoes are the principal crops. The country has no mineral wealth and but little manufacturing.

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CHAPTER XXIX

BORDER LANDS OF THE MEDITERRANEAN

Geographic Unity of the Mediterranean Lands.—More than a dozen countries and political dependencies are situated about the borders of the Mediterranean Sea. Within these political divisions are included diverse conditions of local topography and climate, many peoples, and many languages. Yet, from the standpoint of economic geography, they have a sufficient number of conditions in common to permit their being grouped together into one of the primary geographic regions of the world. The most fundamental of the unifying conditions is (1) similarity of climate. Others of consequence are (2) similarity of topography, (3) common frontage upon an inland sea, (4) a degree of similarity in location with respect to the principal land masses of the world, and (5) a general meagerness of those natural resources which are fundamental to large industrial and commercial development.

Consequences of Climatic Conditions.—A combination of climatic factors so distinctive as to have acquired the name "Mediterranean" characterizes nearly all parts of the border lands of the Mediterranean Sea. The outstanding features of this climate are (1) subtropical temperatures with smaller annual range than the average for the latitude; (2) low annual rainfall, with a winter maximum; (3) a high percentage of sunshine.

This type of climate, while it is favorable to certain crops and industries, imposes strict limits upon the development of others. The perennial crops must be those which are able to withstand summer heat and drought, such as the olive and the vine, or those which thrive under irrigation, such as citrus fruits. Fall-sown cereals which, in the mild winter temperatures, can make use of the winter rains, furnish the staple foods. Because of the summer drought good pastures are difficult to maintain, and their scantiness is evidenced by many sheep and goats but a relatively smaller number of cattle. The mild and sunny winters of the Mediterranean shores have made the region a winter resort for people of the more gloomy north European countries. Even northern Italy has 25 per cent of possible sunshine in its most rainy month.

Consequences of Topography.—The geologic history of the Mediterranean region has left its mark upon the coastal outline of the land and upon the configuration of its surface. A series of subsidences along the southern margin of the older land masses of central Europe are responsible for the creation of the basin of the Mediterranean Sea. With these same processes were associated some of the mountain-building forces which have resulted in the hemming in of the region as a whole by mountains, from whose main axis project southward a series of peninsulas—Iberia, Italy and the Balkan Peninsula. Fringing this irregular margin are the unsubmerged portions of other mountains which appear as islands, large and small.

The separation of the border lands of the Mediterarnean into many distinct physical units has had a profound influence upon the history of mankind. The total area of these lands is not half so great as the area of the United States, yet they include, wholly, or in part, eight independent states and several dependencies; at least eight distinct languages, and a large number of dialects. The latter, as in all old countries, are to be attributed in part to the long separation of small groups of people by barriers which prevented easy intercommunication.

Consequences of Frontage upon the Mediterranean.—There can be little doubt that, in the early stages of human development upon the shores of the Mediterranean, the sea was a barrier to human intercourse. Yet at a very early date the Phoenicians, who inhabited a part of the narrow plain at the eastern end of the Mediterranean, had pushed out from their shores to nearby islands and coasts. With this beginning they progressed from one island to another until they penetrated to every corner of the sea and beyond its western portal. After them came the Greeks, the Romans, the Venetians, and the Genoese. The Mediterranean ceased to be a barrier and became a unifying influence, and powerful conquerors arose who welded these border lands into great empires. Yet none has been powerful enough permanently to overcome the tendency to political disunion imposed by the expanses of sea and by the mountainous and disjointed topography.

Consequences of the Location of the Mediterranean among the Land Masses.—Modern civilization owes much of its character to the peoples who inhabited the shores of the Mediterranean, and modern commerce has sprung from beginnings in the same region. During the Middle Ages the Mediterranean was the great commercial thoroughfare of the world. The merchants of Venice and Genoa controlled a large part of the world's trade which flowed between northwestern Europe and the East. But historical events and important discoveries shifted the world's trade to the Atlantic Ocean, and the Mediterranean became only a by-way in the commerce of the world. Its importance has more recently been increased by the reopening of connection with the East through the Suez Canal, yet its ancient position of predominance can never be regained.

Consequences of Character of Natural Resources.—The early traders and merchants of the Mediterranean borders found in the natural resources of the region a wealth of materials for their purposes. For the craftsmen of the Middle Ages local raw materials were, in the main, sufficient. In this respect also the world has changed. Iron and steel have replaced wood and copper and bronze, and the energy of coal has replaced hand power. In the race for modern industrial and commercial supremacy the Mediterranean border lands have been left behind, for nature did not abundantly endow them with the materials upon which modern commerce and industry depend.

AGRICULTURE IN THE MEDITERRANEAN REGION

Importance of Agriculture.—Agriculture has developed in the Mediterranean lands under many discouragements. The hot dry summers restrict the range of possible crops and of livestock industries. The rough topography puts large areas beyond the possibility of cultivation. In Italy one-half, in Spain one-quarter, and in Portugal one-quarter of the land is under cultivation. These are greater proportions than the 20 per cent attained in the United States; and the percentage for Italy ranks among the highest in the world. That this is true attests dense and industrious populations dependent mainly upon the land for a living. About 60 per cent of the persons in all occupations in Portugal, Spain, and Italy are engaged in agriculture. In Greece 45 per cent, and in Algeria 70 per cent are farmers. These figures may be contrasted with those of industrial countries such as the United States, 30 per cent, or the United Kingdom, 6 per cent, to get the full measure of the importance of agriculture to the people of the Mediterranean region.

Wheat is the most important cereal crop of the Mediterranean countries, for it finds in the mild moist winters the necessary conditions for its development (Fig. 197). It is harvested at the beginning of the summer drought, in May in northern Africa, and in June in Spain, Italy, and Greece. Although wheat culture is widely distributed in the region the most important districts are (1) northern Italy and (2) the plains of Old Castile in Spain in which is situated the city of Valladolid, the chief milling center. The maximum importance of wheat is reached in Italy where it occupies about one-third of the cultivated land. In the Po Valley and about Naples it is cultivated very intensively, but in the drier portions of the country, including Sicily, extensive rather than intensive methods prevail and the yields are much lower.

Barley as a winter crop is also well adapted to Mediterranean climatic conditions. It is, however, less desirable for food and wheat tends to replace it where wheat can be grown. Due to the shorter growing season of barley, it is a more certain crop in the districts of scanty rainfall. It reaches its greatest importance in North Africa. On the desert margin in Libia the seed is plowed into the ground in November. If the rains are sufficient a crop is harvested in April or May. In Algeria it occupies almost as much land as wheat (25 per cent of the cultivated area) and usually yields a larger return. The barley of north Africa and of Asia Minor, like that of California, is much in demand in northern Europe for malting, because of its bright color and uniform quality which are the results of dry weather during the ripening period of the grain.

Oats and rye, because of their larger water requirements and lower temperature requirements, are of very little importance in the Mediterranean countries (Fig. 283).

Corn (*Maize*).—The Mediterranean lands do not have a good corn climate; the warm season is too dry. The principal corn regions are (1) northwestern Spain and Portugal, where the summer rainfall is considerable; and (2) the Po Valley of Italy, which has the most nearly continental type of rainfall of any part of that country (Fig. 276). Corn is an important food of the Italian peasantry, yet the acreage of corn in that country is barely one-third that of wheat.

Vegetable crops are cultivated in all parts of the Mediterranean region for local consumption, and in some districts as market garden and truck crops. In Italy, particularly, vegetables are grown by an intensive system of interculture in orchards and vineyards. Near the larger cities and along the principal railways they are grown for market.

Truck farmers on the warm, irrigated coast lands of Algeria and of the Mediterranean coast of Spain specialize in winter vegetables for the north European markets. Special boats and rapid trains carry the produce across the Mediterranean and through France. The Valencia region of Spain is noted for its onions, of which the United States, as well as northern Europe, is a large importer.

Vineyards.—The Mediterranean lands are believed to be the home of the viniferous types of the grape (Fig. 215). The vineyard is common to all the countries from Portugal to Persia. As in California, grapes are grown for wine, for raisins, and for table use. A number of famous wines take their names from Mediterranean places; Sherry from Jerez in southern Spain, and port wine from Oporto in Portugal. Most of the wine of the Mediterranean countries is, however, for home consumption.

The production of table grapes on a commercial scale is best organized in southern Spain. In the region of Almeria numerous villages make this phase of vine culture their principal industry and a large export trade is conducted with the cities of northern Europe and of America. The grapes are packed in cork dust and shipped in wooden casks. The increasing ability of California to supply the American market with this type of grape and the reduction in the European market resulting from the war has brought severe hardship to the Almeria grape growers. Early table grapes are grown also on the coast of Algeria.

Many parts of the Mediterranean coast have the requisite climate for the curing of raisins. A commercial industry has, however, developed principally in two regions, southern Spain and southern Greece. The

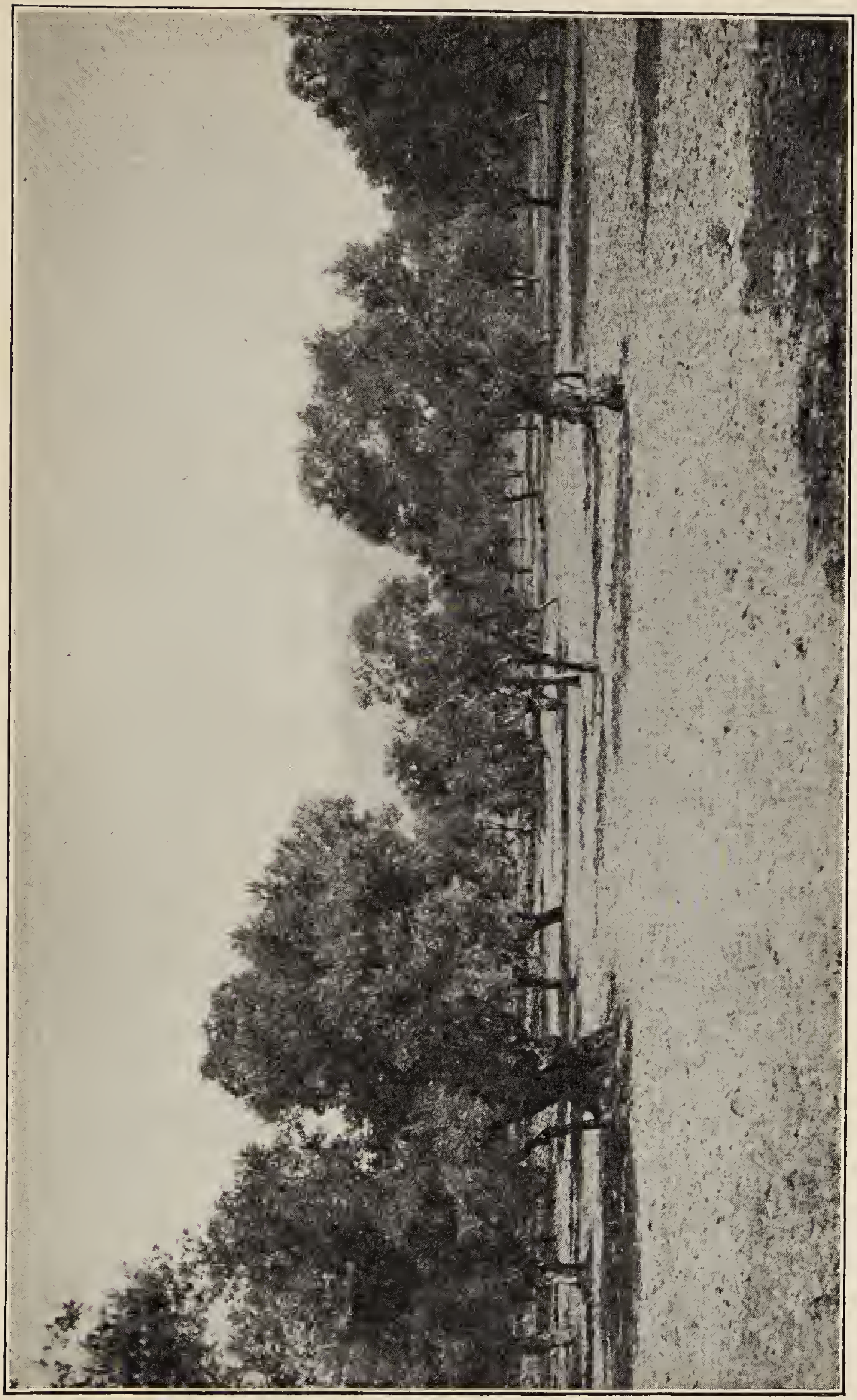


Fig. 262.—Olive trees about 200 years old. Their bulbous bases, gnarled trunks, and narrow, leathery leaves indicate a high degree of resistance to drought. (*U. S. Bur. of Foreign and Domestic Commerce*).

Spanish city of Malaga has given its name to a type of raisin now produced in several other parts of the world. It is still the center of an important raisin district. On the shores of the gulfs of Corinth and Patras, on the islands of Cephalonia and Zante, and in southern Greece are vineyards which specialize in a small, seedless grape. When these are cured into raisins they are known as "currants" (a corruption of "Corinth"). As there is little domestic market for this product, nearly the entire supply (sometimes 150,000 tons) is exported. Currants rank second only to tobacco among the exports of Greece.

The drying of fruits other than raisins is favored by Mediterranean climatic conditions. Prunes are abundant in Jugoslavia, Italy and southern France. The Smyrna district in Asia Minor is the center of the world's principal dried fig producing region. The same fruit is exported from Greece, Italy, Spain, and Portugal.

The Olive.—Of all crops, the olive is perhaps most peculiar to the Mediterranean type of climate. The tree is native to the Mediterranean lands and has been cultivated there throughout human history. It has been successfully introduced into all other regions having this type of climate, but it is still much more important in the border lands of the Mediterranean Sea than in all other parts of the world combined.

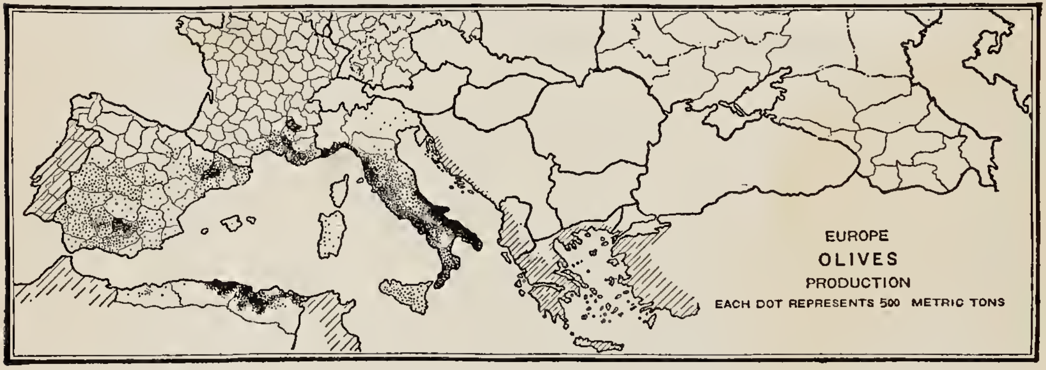


FIG. 263.—The olive is one of the distinctive crops of the borderlands of the Mediterranean. (*U. S. Dept. Agr.*)

The ability of the olive tree to thrive in the heat and drought of the Mediterranean summer is due to the plant's characteristics: (1) a finely divided and extensive surface root system is able to make efficient use of very small amounts of rain; (2) the narrow, thick, leathery leaves are covered with densely matted hairs and, together with the stems, are equipped for economy in the utilization of the water collected by the roots.

Figure 263 shows the distribution of the principal olive-growing districts of the Mediterranean lands for which data are available. The olive trees are often restricted to the dry and rocky hill slopes, the level land being reserved for cereals and irrigated crops. Although some olives, particularly in Spain, are raised for the preparation of pickled and preserved fruit, most of the crop is used for the manufacture of olive oil, a product that has long occupied the important place in the local diet held in northern Europe by butter and other animal fats. Italy and Spain are large exporters of olive oil. The surplus available for exportation is usually greater in Spain, because of smaller domestic requirements.

Citrus fruits are grown for home use in nearly all parts of the Mediterranean coast. The principal commercial districts are (1) the irrigated valleys and coastal margin of the province of Valencia in Spain, (2) southern Italy and Sicily, and (3) the coast of Palestine, especially near Jaffa. The principal citrus fruit is the orange, except in Sicily where most of the European lemons are grown. England furnishes the chief market for the Mediterranean citrus fruits.

SILK

The Mulberry and Silk Raising.—The mulberry tree is found in most of the more humid parts of the Mediterranean region, and silk raising is an industry of some importance in Spain and southern France, but more particularly so in Italy. In the Po Valley the winter temperatures are too low for the olive and the citrus fruits. The mulberry is hardy and, with irrigation, produces an abundant crop of leaves during the warm season. The dense population of this valley and the many small farms furnish the necessary conditions for a supply of cheap but skilful labor and the close supervision required in silk production. Italy ranks next after Japan and China in this industry.

PASTORAL INDUSTRIES

Cattle and Dairying.—The statement previously made in regard to the unimportance of the cattle and dairy industries in the Mediterranean lands must be taken in a comparative way only. In Italy, which has more cattle than any other Mediterranean country, the number per square mile is far less than it is in the north European countries, yet it is twice that in the United States (Fig. 198). In the Po Valley there are more cattle per square mile than in Iowa, and in no part even of southern Italy is the number so low as in Nevada. Relative to the human population, however, the number of cattle in Italy is less than one-third as great as in the United States.

Many of the cattle in the Mediterranean countries are draught animals. Some are raised for beef and doubtless most are eventually utilized for food. Yet, in proportion to the population, the quantity of beef produced is small. Consequently the per capita consumption of beef is small, for the generally low purchasing power of the people does not permit of a large importation of foreign beef.

In most parts of the Mediterranean region dairy cows are extremely few. In the drier portions of southern Spain, Italy, and Greece they are found scarcely at all except a few near the larger cities. An organized dairy industry of the north European type exists in but few places, and only in northern Italy are dairy cattle numerous. On the irrigated lands of the Po Valley and the pastures of the Italian Alps cheese production is an important industry and there is normally a surplus of cheese for exportation.

Sheep and Goats.—The ability of sheep and goats to subsist on rough mountain pastures and scanty summer forage has given them great importance in the Mediterranean lands (Fig. 204). Spain is the home of the fine-wooled Merino sheep, and for several centuries sheep raising was the most important industry of that country (Fig. 264). An organization of rich and influential sheep owners long had practical control of the civil affairs of the nation, much to the discouragement of settled agriculture. Large bands of sheep, under the charge of shepherds, moved about from lowland winter pastures to the mountain pastures of the summer, just as they now do in Arizona and Nevada. Throughout the Mediterranean borders, sheep and goats far outnumber cattle. They furnish wool, hair, and skins for local manufactures and for export, meat for domestic consumption, and milk for direct use and for cheese. The number of sheep and goats employed in milk production is greater than that of cows in all Mediterranean countries, but particularly so in the East. Much of the sheep's milk is used for cheese, more of the goats' milk being consumed fresh. The importance of the sheep in the dry lands of the East is seen also in the wool used in the rug manufactures of Asiatic Turkey. Asia Minor is the home of the Angora goat, now raised also in other parts of the world for its fine hair, which is known commercially as "mohair."

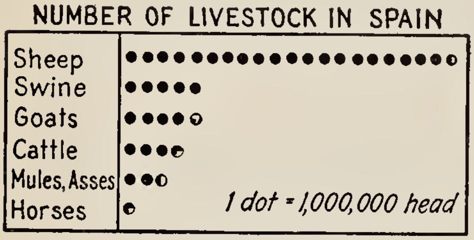


Fig. 264.

Other Domestic Animals.—Swine are not numerous in the Mediterranean region (Fig. 234), in part due to the fact that most of the grain is required for human food. Yet in Spain and Italy they are raised in small numbers by the peasants on waste food products, and in larger numbers upon the limited supplies of acorns and other forest feeds. In the Asiatic and African portions of the Mediterranean border, the prevalent Mohammedan religion encourages a prejudice against the use of pork products.

Just as the rough topography and dry climate increase the relative importance of sheep and goats over that of cattle, so it increases the relative importance of the ass and the mule over that of the horse.

Northern Africa and western Asia are believed to be the original habitat of wild asses from which the many domesticated breeds have descended. The largest and most valuable are now raised in Spain and southern France.

NATURAL RESOURCES

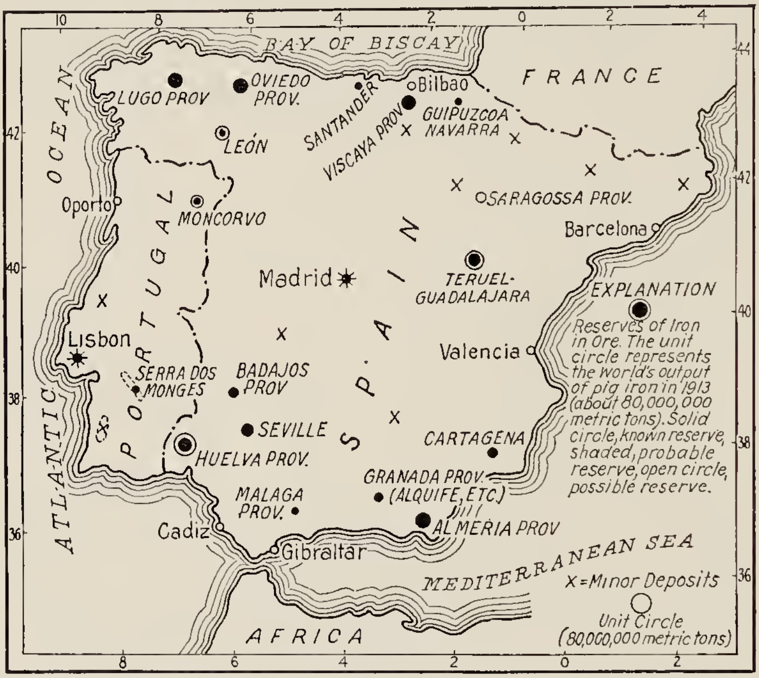
Forest Resources.—In ancient times the lands of the Mediterranean border had considerable forest wealth of oak, chestnut, beech, pine, and other valuable timber trees, mainly hardwood. Fire, destructive lumbering for more than 2,000 years, indiscriminate wood cutting, and the unrestricted browsing of sheep and goats have left for the present generation but a small part of this resource. In most of the countries the supply of timber barely serves to meet the local requirements, limited as they are through poverty and lack of commercial and industrial development; in some, importation of timber is necessary. The principal forests remaining are (1) those which clothe the more rainy and remote mountain slopes, (2) those which are under government protection, or (3) those which yield valuable products other than timber. Among the last named are the chestnut forests of Italy which supply an important item of food to the people, and the cork oak groves of Spain, Portugal, and north Africa. In southern Portugal the cork oak is of particular importance. Its products rank next to wines among the exports of the country.

Source of Fuel and Power.—A survey of the fuel and power resources of the Mediterranean countries provides at once an explanation of the predominance of agricultural pursuits and a basis for estimating the future possibilities of these lands. Of coal there is, in the entire Mediterranean region, extremely little. Of all the countries, Spain is best provided, yet its maximum output of coal and lignite is little more than half enough for a limited domestic requirement, and Italy depends almost entirely upon English and other imported coal.

The water power resources of the Mediterranean region are considerable, much greater than the coal resources (Fig. 202). The low average rainfall and its great variability is not well suited to power production, yet the high altitudes and the many steep slopes and mountain valleys provide the necessary fall and also provide favorable conditions for storage reservoirs. In general, the shorter streams and the lower and more erratic rainfall of North Africa and of the eastern end of the Mediterranean region are not favorable for power development. Spain and Italy have the most water power in use and the greatest prospects for the future. The principal water powers of Spain, both developed and prospective, lie in the more rainy northern part of the country, however the developed powers probably are not more than one fourth the amount capable of development. For similar cause the principal water powers of

Italy are in the North. The provinces at the foot of the Alps are particularly favored in this respect because of (1) the high altitudes and steep slopes of the mountains and their valleys, (2) the heavy rainfall fairly well distributed throughout the year, (3) natural regulation of stream flow due to (*a*) the summer melting of Alpine glaciers, and (*b*) to the presence of the large glacial lakes, such as Como and Garda, in the Alpine valleys. Italy has in service about 2,300,000 horsepower, one-fifth as much water power as the United States; its resources are estimated at barely 2 times the present utilization, not a large amount at best.

Sources of Mineral Wealth.—Metals and minerals of moderate value and variety are found in the Mediterranean region, and a few of the deposits have had an important place in the history of the world's industrial development. The Rio Tinto copper mines in southwestern Spain, for example, have been worked since the days of the Phoenicians and still are the largest producers in Europe, although they yield a comparatively small part of the world's output. The quarries of Carrara, Italy, and the Parian quarries of Greece yielded marbles for ancient works of art and are still producing for domestic use and for export. The mineral products of the Mediterranean region have, in general, been far excelled in value by the products of other fields of greater extent or of richer ores. In the supply of only a few of these substances do the Mediterranean countries rank high in world output. Pyrite, of which Spain and Portugal mine 75 per cent of the world supply, and the sulphur


10
8
6
4
2
0
2
4
BAY OF BISCAY
FRANCE
ATLANTIC OCEAN
LUGO PROV
OVIEDO PROV.
Bilbao
SANTANDER
VISCAYA PROV.
GUIPUZCOA
NAVARRA
LEON
Oporto
MONCORVO
PORTUGAL
SPAIN
SARAGOSSA PROV.
Barcelona
Madrid
TERUEL-GUADALAJARA
Lisbon
SERRA DOS MONGES
BADAJOS PROV
Valencia
SEVILLE
HUELVA PROV.
CARTAGENA
GRANADA PROV. (ALQUIFE, ETC.)
MALAGA PROV.
ALMERIA PROV
Cadiz
Gibraltar
MEDITERRANEAN SEA
AFRICA
EXPLANATION
Reserves of Iron in Ore. The unit circle represents the world's output of pig iron in 1913 (about 80,000,000 metric tons). Solid circle, known reserve, shaded, probable reserve, open circle, possible reserve.
x = Minor Deposits
Unit Circle (80,000,000 metric tons)
42
40
38
36

OUTLINE MAP OF SPAIN AND PORTUGAL SHOWING RESERVES OF IRON IN ORE

Fig. 265.—Regions of the Iberian Peninsula where iron ore is found. (*Bull.* 706, *U. S Geol. Surv.*)

of Sicily are examples of minerals which are abundant and cheap elsewhere but are produced in these countries in so large a proportion because of cheap labor. The phosphates of Algeria and Tunis and the mercury of Spain and Italy are important resources because they constitute large fractions of the known supplies of the world.

Iron ores are found in Greece, but since there is little coal with which to smelt them, they are mined in but limited quantity. In Italy, however, the supply is not sufficient for the home industries built upon a basis of imported coal. Spain has a surplus of iron much of which is exported to England (Figs. 200 and 265). The exports pass mainly through the ports of Bilbao and Santander (Fig. 265), which are no farther from the English smelting centers than are the Lake Superior iron ores from Pittsburgh.

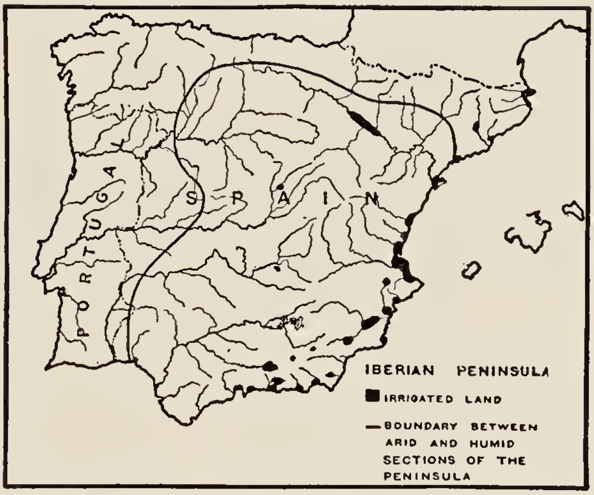


Fig. 266.—The irrigated lands of Spain. (*U. S. Dept. Agr.*)

Industrial and Commercial Development

Spain and Portugal.—The Iberian Peninsula has not kept pace with the countries of northwestern Europe in industrial and commercial development, but this fact may not be attributed to its geographic location. Situated near the center of the world's commercial activity, streams of trade flow about it on all sides. Moreover, it is favored with extensive frontage on both the Atlantic Ocean and the Mediterranean Sea. Both Spain and Portugal were formerly possessed of vast colonial empires which have fallen away part by part until but small and relatively unimportant remnants are left. Many factors have combined to arrest the development of these two countries, among which those of an historical and of geographic nature are clearly of great importance. The handicaps imposed by topography, climate, and limited resources upon the Mediterranean region as a whole have been noted; certain others apply to the Iberian Peninsula in particular.

Transportation.—The semi-arid plateau-and-mountain character and the relatively sparse population of much of Iberia have made an extensive railway system financially impossible. In proportion to its area, Spain has only one-third the railway mileage of France. Many towns in Spain are without railway service and even without wagon roads. Due to the plateau character of the peninsula and to the extreme seasonal fluctuations in stream volume, the use of the rivers for navigation is negligible. Although the coast line is long, its regularity is interrupted by very few natural harbors of a sort to invite modern shipping.

Historical Influences of great significance also have retarded the industrial and commercial development of Spain and Portugal. Without adding detail in this connection, it may be said that, among other things, events in the history of Spain particularly have had much to do with the aversion of the Spanish people, especially the Castilians, toward industrial and commercial occupations.

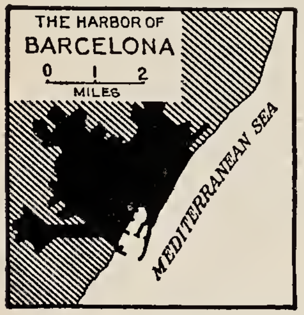


Fig. 267.—The regular coast and artificial harbor at Barcelona.

Barcelona the Industrial Center.—The province of Catalonia, and in particular the city of Barcelona, is the only important industrial center in the Iberian Peninsula. The Catalans are an energetic people with a different racial and historial inheritance from the Castilians. The region has considerable water power which renders it less dependent on foreign coal. The principal industries are textile manufacturing and paper making. The raw materials, particularly cotton, are largely imported. Barcelona is the principal seaport of Spain (Fig. 267); it has an excellent harbor which is, however, almost entirely artificial.

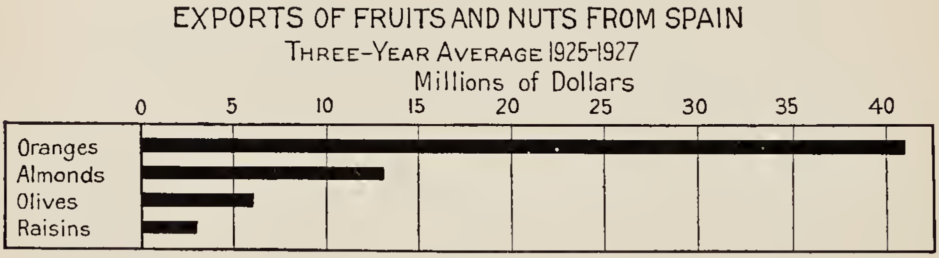


Fig. 268.

Italy.—The geographical advantages of Italy for industrial and commercial pursuits are somewhat less than those of Spain. Yet the industrial wares produced are more abundant and varied, and the value of foreign trade is notably greater. This difference may be attributed to a combination of historical and economic factors such as (1) the different attitude toward industrial pursuits from that held by many Spanish people, (2) closer political and economic association with the industrial nations of Europe and the desire to compete with them in material progress. The limited natural advantages for industrial development, have, however, notably influenced the character of Italian industrial wares and the places of their manufacture.

The largest number of Italy's manufacturing plants are those which deal with agricultural raw materials, such as flour mills. These are mainly small and are widely scattered. Textile mills for the manufacture of silk, cotton, and wool are established mainly in the Po Valley where water power and abundant labor are available. Milan is the principal city of the industrial district and is noted particularly for its silk and cotton manufactures. Many minor industries, such as straw plaiting and the making of objects of art, reflect an abundance of skilful labor and a scarcity of the common industrial raw materials and of power.

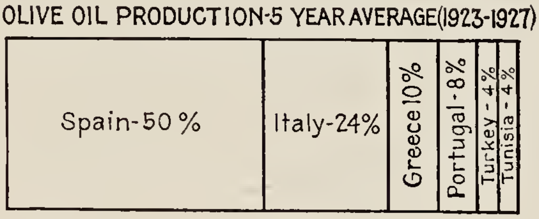


Fig. 269.

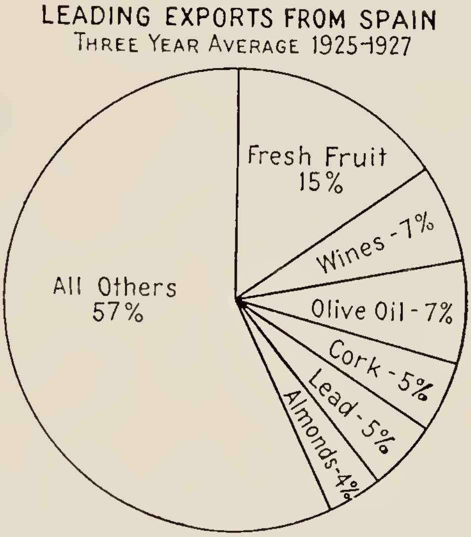


Fig. 270.—The products of agriculture and mining furnish the leading exports of Spain.

Raw silk together with the products of silk and cotton manufacturing furnish the principal exports of the country. Wheat, coal, and raw cotton are the main imports. The natural harbors of Italy also are few. Even the most used ports, Genoa and Naples, have required considerable improvement to make them safe and adequate for modern commerce.

Greece and the Levant.—The countries which border the eastern end of the Mediterranean—Greece, Turkey, and its former dependencies, were once the seats of the world's greatest industries and the home of the originators of ocean trade. Today they are, by comparison with west European lands, almost wholly agricultural and have neither manufactures nor commerce of significance. The lack of these developments is due in large measure to (1) the absence of fuel and power, and (2) to the disturbed political conditions and, especially in Turkey and its dependencies, to governmental evils which have retarded the utilization of even the limited resources at hand.

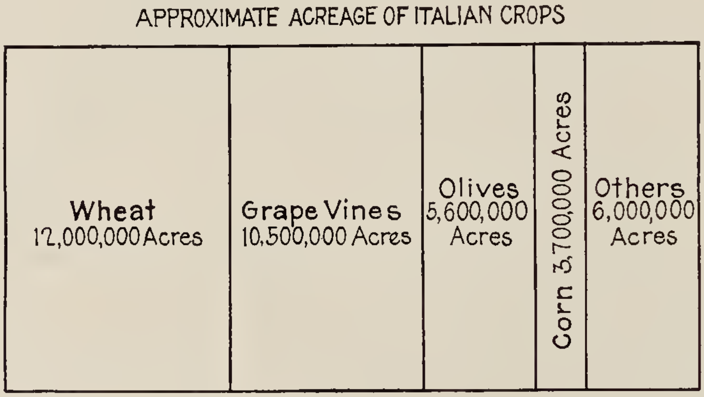


Fig. 271.—In spite of its mountains Italy has over 40 per cent of its land in crops, a high percentage.

The items which constitute the staple exports of Greece and the Levant are mainly those of agricultural and pastoral origin. These are shipped raw or after having passed through processes of manufacture which require much hand labor and but little power or mechanical equipment. Fruits, fresh and dried, tobacco, hides, skins, and wool, both raw and in the form of rugs and carpets, are leading exports.

Mediterranean Lands of Africa.—Industrial and commercial development in the coastal strip which includes Morocco, Algeria, Tunis, and Tripoli is limited by (1) absence of fuel and power, (2) lack of the principal raw materials of industry, (3) the retarding influence of the Mohammedan faith. Manufactures are small and unimportant. Foreign trade has been stimulated by French interests, and consists in limited exports of agricultural, pastoral, and mineral products, with imports of manufactured wares. Several of the ports of this coast, especially Tripoli, are the termini of desert caravan trade routes from the south, now much less important than they once were.

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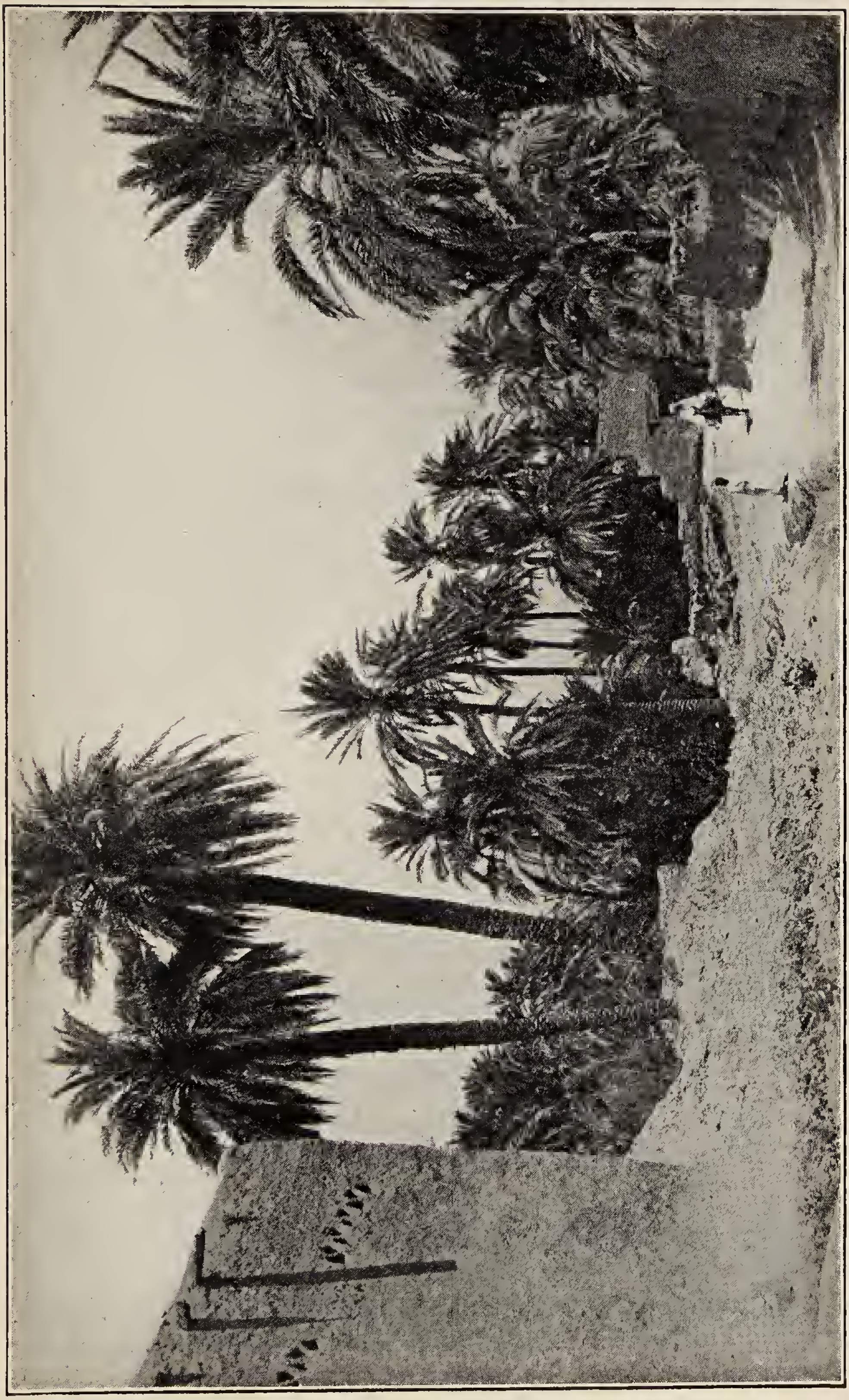

Fig. 272.—Date palms in the oasis of Biskra, Algeria. (*U. S. Dept. Agr.*)

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CHAPTER XXX

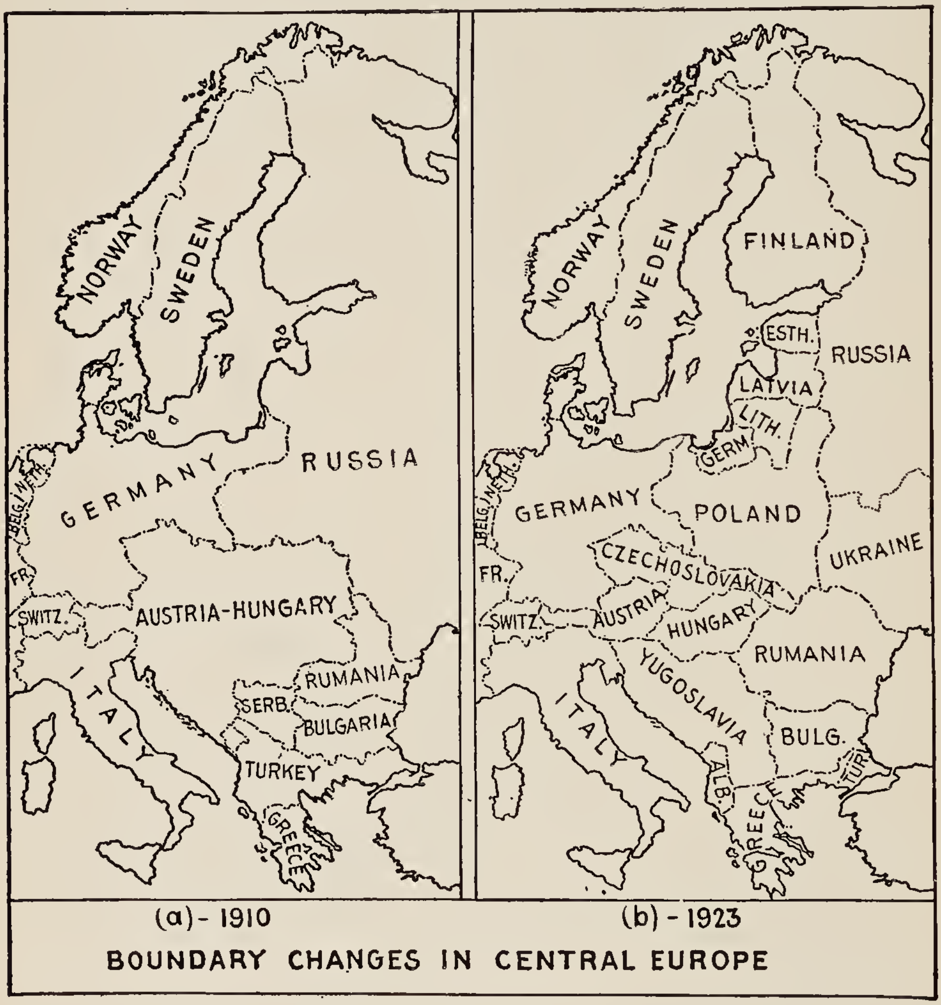
SOUTHEASTERN EUROPE

A Complex Region.—Southeastern Europe is a region of great diversity, but in certain respects, it is also a geographical unit. The region is made up of a group of small states in one of the most distinctive parts of Europe. On the whole, it is a region of mountains with two well-marked plains—in Hungary and Rumania. To a degree it is bound together by one of Europe's great rivers, the Danube, which touches six of the countries and plays a considerable part in their commercial life. This river is of sufficient unifying influence to have suggested a union of the small states in its basin into a Danubian confederation. There are, however, wide differences among the various parts of southeastern Europe, and the highly mountainous character of the region, with its many barriers to human intercourse, has kept alive racial antagonisms, and has prevented the blending of the peoples. The northern part has long been influenced by German ideas and by German immigrants who settled there in considerable numbers. The northern part suffered least from the Turkish invasion, and the extreme north and west was never under Turkish domination. The greater part of this region, however, was conquered by the Turks and held by them for several hundred years.

Austria and the Bohemian portion Czechoslovakia are industrialized countries, resembling the countries of western Europe. Hungary and Rumania are agricultural, but are in a higher state of development than Yugoslavia, Albania, or Bulgaria. Southeastern Europe, then, has three quite distinct economic regions: (1) industrialized Austria and Bohemia; (2) the agricultural plains of Hungary and Rumania, which countries have reached a relatively high degree of advancement; and (3) mountainous states south of the Danube, still in a backward condition and politically turbulent; the Balkans are often referred to as the "cock pit of Europe."

The "commercial drainage lines" of the region extend in three directions. The northern section, especially Czechoslovakia, seeks its ocean outlets mainly at the north. Austria, Hungary, and Yugoslavia have in the past found their sea outlets on the Adriatic; Rumania is distinctly a Black Sea country, and Bulgaria, now cut off territorially though not commercially from the Aegean, has its only coast line on the Black Sea. A commercially unifying influence, however, is found in the important line of railroad connecting the capital cities Vienna, Budapest, Belgrade, Sofia, and Constantinople—the route of the Oriental Express.

Consequences of the Geographical Location of the Region.—At various times in the past Asiatic peoples have invaded Europe, and the paths of these invasions were determined by the major geographical features of the region. The Caspian and Black seas forced the invaders to pass either north or south of these bodies of water, and the heavy forests of middle and northern Russia forced the invaders to keep well to the south, where the open steppe lands made their movements relatively easy so far as natural obstacles were concerned. If the invasion were attempted by a route lying south of the Black Sea, the only convenient entrance to Europe was at the Bosporus and Dardanelles. The earlier invasions from Asia, including the coming of the Huns, Serbs, and Bulgars, followed the steppes of southern Russia and were stopped when they reached the mountainous lands of southeastern Europe. The last of these Asiatic invaders, the Turks, over four centuries ago came in by way of the Constantinople route, and pushed northward almost to Vienna, where they were stopped and were slowly driven backward for 300 years until they have been driven almost out of Europe. But the region which received both lines of invasion was this Danubian-Balkan region and a part of it has been freed from Turkish rule only a generation or two. It may be


NORWAY
SWEDEN
RUSSIA
GERMANY
BELG.
NETH.
FR.
SWITZ.
AUSTRIA-HUNGARY
ITALY
RUMANIA
SERB.
BULGARIA
TURKEY
GREECE
NORWAY
SWEDEN
FINLAND
ESTH.
RUSSIA
LATVIA
LITH.
GERM.
GERMANY
POLAND
BELG.
NETH.
FR.
CZECHOSLOVAKIA
UKRAINE
SWITZ.
AUSTRIA
HUNGARY
RUMANIA
YUGOSLAVIA
ITALY
BULG.
TUR.
ALB.
GREECE

(a) - 1910 (b) - 1923

BOUNDARY CHANGES IN CENTRAL EUROPE

Fig. 273.

said, then, that southeastern Europe is the least Europeanized part of the continent. Moreover, the extremely mountainous character of the Balkan Peninsula hinders that free intercourse of peoples by which civilization spreads. Such an environment breeds a spirit of personal independence, even lawlessness, which makes wars easy to start, and the Balkans have had rather more than their share of wars.

The Present Political Divisions. (See Fig. 273.)—Southeastern Europe is now divided among nine nations; Austria, Hungary, Czechoslovakia, Rumania, Yugoslavia, Albania, Greece, Bulgaria, and Turkey. Austria and Czechoslovakia belong as much to central Europe as to southeastern Europe, and their high economic development places them among the industrial nations. Greece is located on the Mediterranean, and, along with other Mediterranean lands, is treated in Chapter XXIX.

AUSTRIA

The Dismemberment of Austria-Hungary.—The pre-war Austro-Hungarian Monarchy included many peoples who were more or less unfriendly to one another. No less than seven distinct nationalities and many lesser racial groups were included in this heterogeneous nation.

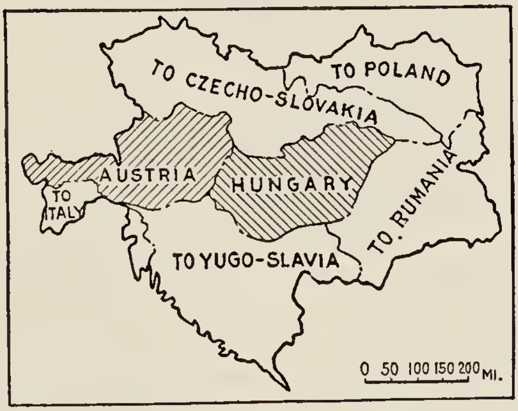


FIG. 274.—The dismemberment of the Austro-Hungarian monarchy following the World War.

With the defeat of the Central Powers in the World War came a complete dismemberment of the nation whose acts in 1914 precipitated the war, and its territory was divided into the two small nations of Austria and Hungary and the remainder allotted to Poland, Czechoslovakia, Italy, Rumania, and Yugoslavia (Fig. 274).

The Present Republic of Austria.—The Austrians are not a separate race but are a division of the Germans. After the war they desired to be allowed to unite with Germany, but this was forbidden by the Allies. In 1922 Austria was in the most pitiable condition of any of the defeated countries—utterly bankrupt, her currency next to worthless, burdened with a debt that she can never hope to pay, and so small and poor in natural resources that she is largely dependent upon other countries for almost all her necessities.[1] The most prosperous industrial and mineral-producing section of Austria-Hungary was Bohemia, and the best agricultural lands were in Hungary. These and almost everything else have been stripped away, and all that is left to Austria is a mountainous region without seacoast, with little agricultural land, few minerals of any kind except iron ore and practically no coal with which to smelt it.

CZECHOSLOVAKIA

The People.—Of about 14 million people in the republic, the Czechs and Slovaks together constitute 65 per cent. The other 35 per cent consists of a large and influential body of Germans and a considerable number of Ruthenians, Poles, and Hungarians. The Czechs or Bohemians are the dominant group; they are an educated, patriotic, capable people. The Slovaks and Ruthenians are largely peasants with little education; they live in the country or in small villages, were oppressed by the former government, and are far behind the Czechs in alertness and progressiveness. During the trying post-war years, the Czechoslovak government displayed a commendable poise and sanity, and created a favorable impression upon the nations of the world. The large body of Germans in the population forms a serious problem, for they are a substantial and able people and are a dangerous minority if they should become actively hostile to the government.

Size, Shape, and Location.—Czechoslovakia is the size of Wisconsin, but it extends 600 miles east and west. Its shape is unfavorable from a military point of view, and its position exposes it to dangers of attack from any one or more of 5 countries that join boundaries with it; and it lies in one of the most dangerous parts of Europe from the standpoint of possible future wars (Fig. 273). Its government has already obtained the formal friendship of Rumania and Yugoslavia, forming the Little Entente. Commercially the location of the country is central and favorable except for lack of a seaport. It lies between industrial west Europe and agricultural east Europe and midway between the Baltic and the Adriatic seas. If tariff walls are not made too high by the surrounding countries, and if free movement of products by rail and river can be established and maintained, the geographical location of Czechoslovakia will prove to be excellent for commerce.

Physical Features.—On the northern frontier Czechoslovakia is distinctly set off from Germany and Poland by mountain barriers; it is set off by equally distinct natural boundaries from Bavaria and Austria on the west and southwest, but the boundary between Czechoslovakia and Hungary is not determined by natural features, and is the one most likely to cause future trouble. Most of Czechoslovakia is a dissected upland, 1,000 to 3,000 feet in elevation, but it includes considerable areas of valley land of agricultural quality; 42 per cent of the total area is arable, and 33 per cent is so rugged that it is given over to forests. The northern mountain barrier of Bohemia is cut through by the navigable Elbe, giving the country easy water and rail communication with Germany, and placing Prague, the capital of Czechoslovakia, on the main line of railroad from Berlin to Vienna. A little farther east the Moravian Gate between the valleys of the Oder and the Danube opens an easy route between the rich industrial and mining district of upper Silesia and the Danube lands. The mountainous eastern end of the republic, skirted on the north by the mountain wall of the Carpathians, is somewhat isolated and includes the most backward people of the nation.

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[1] An international loan, guaranteed by several of the financially stable European nations, was made to Austria in 1923 and saved the country from complete financial collapse.

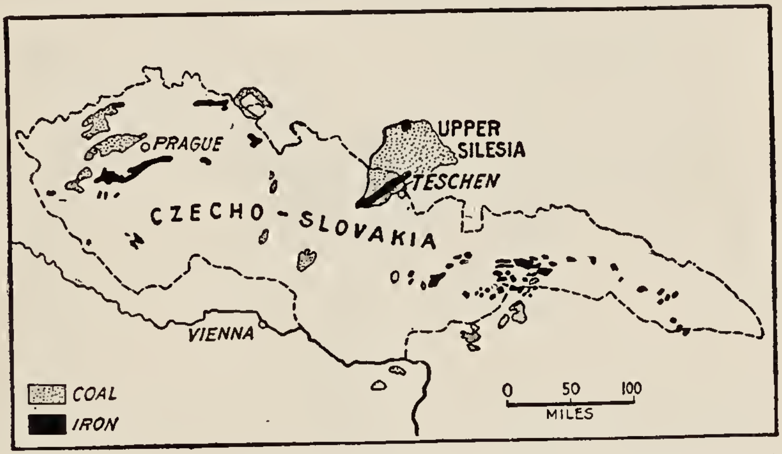

Fig. 275.—Regions of Czechoslovakia where coal and iron are obtainable. The advanced industrial development of this country is partly due to its mineral resources.

Coal and Iron.—Czechoslovakia is the most richly endowed with minerals of any of the small European countries (Fig. 275). Its territory lies in the east-west mountain belt of Europe in which both coal and iron are relatively abundant; the coking coal of Teschen is of good quality, as are certain other beds, but the larger part is brown coal or lignite which would not be highly esteemed in the United States. The iron ores are of moderate grade, and the richer ores of Sweden are imported by way of the Oder and Elbe to mix with them. In pre-war days the iron ores of Styria in Austria were also used, and probably will be used again as a normal interchange of commodities between Austria and Czechoslovakia is established. While the native iron ores are of distinct advantage to the manufactures of the nation, they are not sufficient to build up a great iron and steel industry, comparable, for example, with th textile industry of the country. The coal of Czechoslovakia is fundamentally of more importance than the iron ores, and constitutes an article of export.

Well-developed Agriculture.—Over half of Czechoslovakia is suited to crops or to pasturage, and the intelligent farmers of Bohemia have learned much from German methods. The agriculture is less intensive than it is in France or Belgium and less scientific than it is in Germany, but more so than it is in Russia and Poland. In many ways Czechoslovakia represents a transition stage between eastern and western Europe. Crops are closely similar to those of our northern states of Michigan, Wisconsin, and Minnesota. Corn is raised, but is not important. The four standard cereals—wheat, rye, barley, and oats—are nearly equal in acreage, and in normal times are practically sufficient for the needs of the country. As in all central Europe, potatoes and sugar beets are crops of primary importance; in fact, Czechoslovakia stresses sugar beet culture so heavily that the country ranks second only to Germany in the exportation of beet sugar (Fig. 233). The raising of cattle and swine as a part of the farm industry is locally of importance. For example, more cattle are raised in Czechoslovakia than in Wisconsin, which is of equal size and is the leading dairying state of the Union. Most of the meat and milk is consumed within the country and these articles are an important factor in bringing about its high degree of self-sufficiency in foodstuffs. In its agricultural development and possibilities, Czechoslovakia is fortunate, and in this fact lies an element of national strength that is not to be overlooked in judging the country's future.

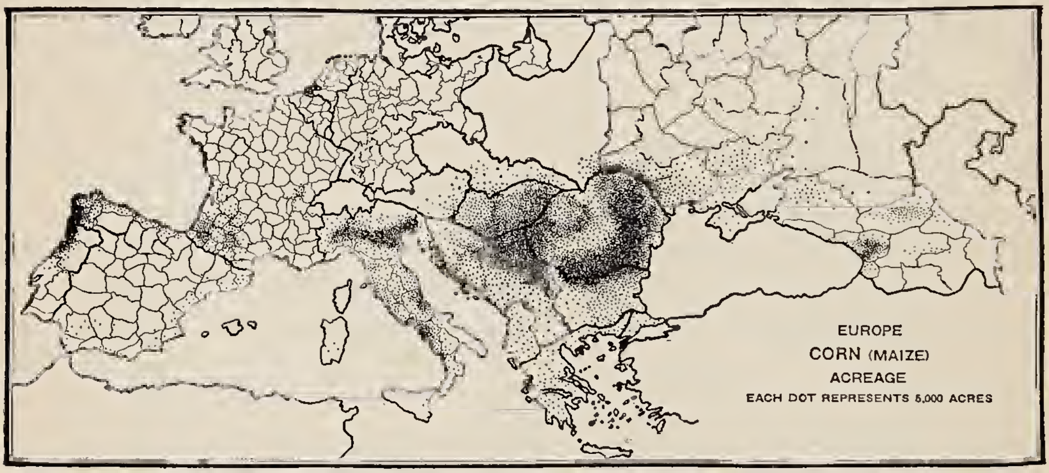

Fig. 276.—The summers of northern Europe are too cool for corn; those of much of southern Europe are too dry. (*U. S. Dept. Agr.*)

The Forest and Forest Industries.—Throughout the hilly and mountainous belt extending east and west across central Europe, from one-third to one-half of the land is too rugged to permit of cultivation, and is the source of a large proportion of the lumber, timber, wood pulp, tanbark, and other forest products used in those regions. The forests of

Czechoslovakia supply most of the forest products required by the country and yield a surplus for export.

Development of Manufacturing.—Of all the Slav peoples, the Czechs have made the most progress in modern manufacturing. Bohemia is a hive of industries, and was the outstanding manufacturing section of the old Austro-Hungarian Monarchy. It is said that the present Czechoslovakia includes the following percentages of the total of pre-war Austria-Hungary:

83 per cent of the coal
60 per cent of the iron
75 per cent of the cotton mills
44 per cent of the paper mills
85 per cent of the hemp mills
80 per cent of the woolen mills
85 per cent of the glass factories
95 per cent of the sugar mills

This noteworthy concentration of manufacturing in the northern part of the old empire, and especially in Bohemia, is mainly due to three factors: (1) the presence of coal and iron, (2) the characteristics of the Czech and German peoples who occupy the region; and (3) its nearness to the highly industrialized portion of Germany. In fact, the industrial part of Czechoslovakia is practically continuous with that of southeastern Germany, and it profited much by its proximity to Germany, the chief exponent of science applied to industry. Above all other products, textiles are important in the industrial life of Bohemia. Since large quantities of raw materials for manufacturing must be imported, only those which are valuable in proportion to weight, and which can be made into relatively valuable goods would justify the costs of transportation. No other group of manufactures so well meets this requirement as cotton, woolen, silk, linen and the coarser textiles made from hemp and jute. Moreover, the lands south and east of Bohemia are large importers of such goods. Bohemia's geographical position, her coal, and her skilled workers make the country the logical manufacturing region for much of southeastern Europe, which, as a whole, has not yet entered the industrial stage. In these markets, however, the German competition is severe.

The Bohemian glass factories, the breweries of Pilsen and Budweis, the glove and shoe factories, and many others have a reputation throughout Europe and America. The cotton mills use large quantities of cotton imported from the United States. In Bohemia 40 per cent of the working people are engaged in manufacturing, as against 32 per cent engaged in agriculture. In Silesia an even higher percentage is employed in manufacturing, but in other parts of the republic agriculture and forest occupations are in the lead. The city of Prague is the center of manufacturing and is one of the foremost cities of central Europe.

Foreign Commerce.—Three navigable rivers are used more or less for the commerce of Czechoslovakia—the Elbe, at whose mouth is the great German port of Hamburg; the Oder, which enters the Baltic at Stettin; and the Danube, chiefly of use in the transportation of agricultural and forest products. Several of the most important railways of central Europe traverse Czechoslovakia and give it—under normal conditions—good connections with surrounding countries. Raw cotton and raw wool for its many textile mills are two of the largest imports of the country. Considerable quantities of foodstuffs are also imported. The chief exports are the manufactured goods—cottons, woolen, beet sugar, glass, and porcelain—which have been mentioned as the leading manufactures of the country. The international trade of this country is most largely with the contiguous countries—Austria, Hungary, Poland, and Germany—although its raw cotton, wool, silk, and jute come from more distant lands. The country is handicapped by its lack of seacoast, and it must be dependent upon rival countries and foreign ports for services that they will not perform any too satisfactorily. Much the greater part of the overseas commerce passes through Germany. The economic life and national prosperity of Czechoslovakia rests upon manufacturing and the exportation of manufactured goods, resembling Switzerland, England, and Belgium in this respect.

HUNGARY

Hungary was united with Austria in the Dual Monarchy of Austria-Hungary until its dismemberment following the World War. The present Hungary has only a third of its former area and population, having lost territory and people to Rumania, Czechoslovakia, and Yugoslavia. The boundaries imposed upon this defeated country are arbitrarily drawn and leave it a total area equal to that of Indiana. About 60 per cent of this is arable, and much is distinctly fertile, though a part is subject to overflow by rivers. It is a country of corn, wheat (Fig. 197), hay, and livestock—one of the distinctively agricultural plains of Europe (sometimes called the "Iowa of Europe"). Three-fourths of the inhabitants are farmers, and a surplus of farm products is available for export. The Hungarian plain has long been one of the sources from which its neighbors have drawn part of their food. In the days of the Austro-Hungarian Monarchy, Hungary was the agricultural member of the union. In Europe before the war only Russia grew more tobacco; only Russia and France produced more wheat; and no European country equaled Hungary in the production of corn (Fig. 276).

Within its present boundaries it has relatively little timber, water power, or metallic minerals of any kind, though it has small deposits of coal, some of which is of good quality. The capital, Budapest, was and probably will remain a manufacturing city of importance. It was the outstanding center of flour milling for all Europe, and has been called the "Minneapolis of Europe." Formerly the port of Fiume, on the Adriatic, was the ocean gateway of Hungary, but the present Hungary has no seacoast. The country is well equipped with railroads, and has a considerable number of fine cities.

RUMANIA

Territorial Growth.—The Rumanians speak a Latin dialect and claim descent from Roman colonists, but they are a much mixed people. The modern Rumania began its successful struggle for independence from Turkish rule in 1829, but did not gain full independence until 1878. At the outbreak of the World War it was about the size of England. It joined the Allies in the war and emerged with its territory and population doubled. The largest addition of land came from Hungary, but provinces of considerable size were also obtained from Russia and Austria (Fig. 277). Rumania now has an area somewhat greater than that of the British Isles and a population of 18 million people, three-fourths of whom are Rumanians.

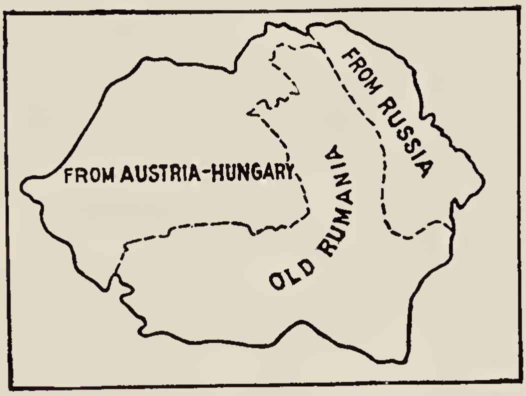

FIG. 277.—Territory added to Rumania after the World War.

An Agricultural Country.—Rumania includes within its borders an important section of the Carpathian Mountains and other mountainous land, but it also includes a large extent of the plains of the Danube Valley—good agricultural land. It is far enough south to fall within the corn belt of Europe, and is at present the largest producer of corn (maize) outside of the Americas, yet its total production is only one-fourth that of Iowa. Wheat ranks next to corn in Rumanian agriculture, and western Europe depends considerably upon wheat from the Danubian countries. In addition to these crops, the country raises most of the products of the temperate zone, and cattle and sheep are numerous in the foothills and mountain pastures.

About 80 per cent of the people are engaged in agriculture, in part on large estates and in part on small holdings. Here as in many other

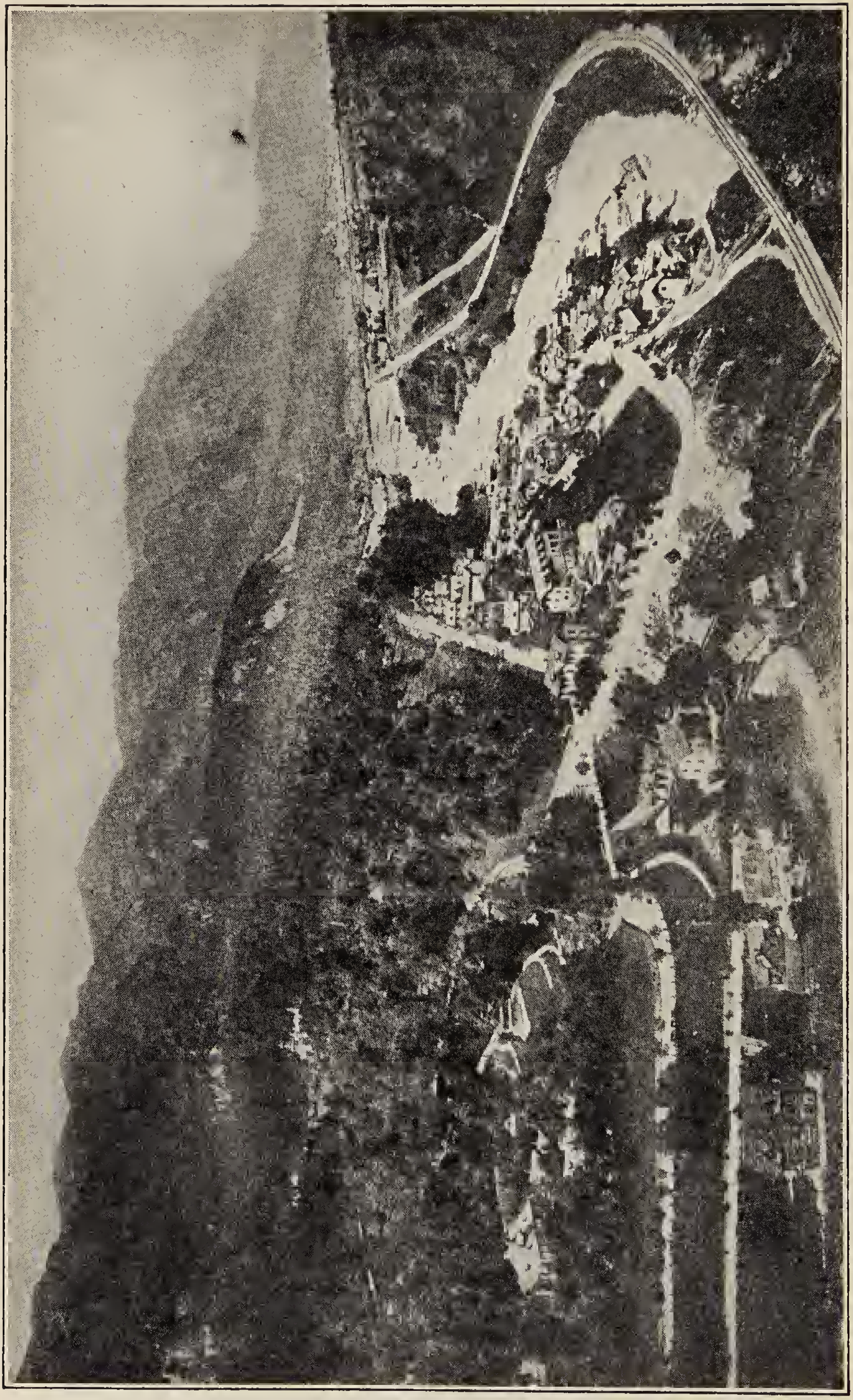

Fig. 278.—Scene in the mountainous part of Rumania, which was formerly a part of Hungary. Only a minor part of the land can be cultivated and the principal towns and the few railroads are in the river valleys. (*Copyright Underwood and Underwood.*)

parts of Europe an effort is being made to divide the large estates held by the gentry and nobility and to distribute the land in small holdings among the peasantry. Such a plan is unquestionably wise for a variety of reasons; men who own land are more interested in all that goes to make for good government; they are more contented, more conservative, and more settled. All experience shows that a nation's strength and stability are promoted through a wide distribution of the land among the people.

While Rumania has forest resources and mineral resources of value, her national wealth and national strength lie primarily in her agricultural population. A large exportable surplus of farm crops and farm animals can be produced, and from this income the necessary imports can be paid for.

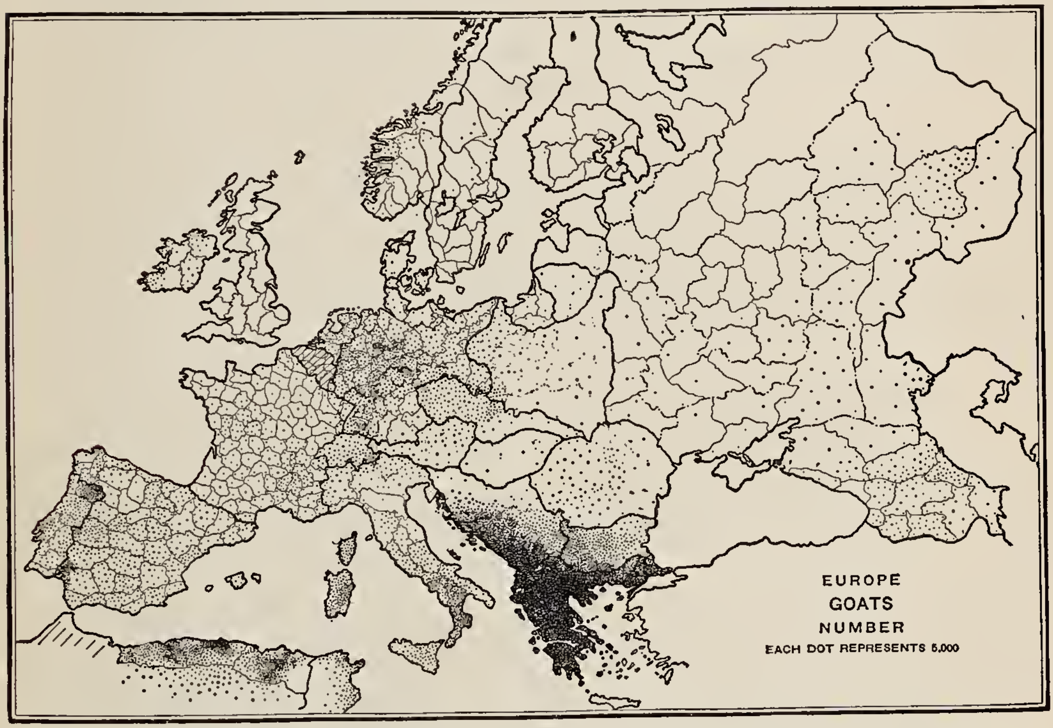

Fig. 279.—Goats are most profitable and numerous in the rough lands of Europe and are particularly so in the rough, dry lands of southern Europe. (*U. S. Dept. Agr.*)

Mineral Wealth.—On the lower slopes of the Carpathian Mountains the geological structure which is necessary to the preservation of petroleum deposits is found, and in various places oil fields of importance have been developed. Rumania supplies only 2 or 3 per cent of the world's petroleum, yet even this amount is significant in Europe, which requires so much oil and produces so little. The oil fields of Galicia—now a part of Poland—are on the northern side of the same mountains.

Rumania has large deposits of salt and small deposits of coal and of iron—enough to serve moderate local needs, but not enough to form the basis of any large manufacturing industry. Other minerals occur, but up to date have not been found in quantity. Petroleum, however, is one of the principal exports of the country.

Other Economic Interests.—Rumania has no less than 18 million acres of forests; it has upwards of a million horsepower of water power, very little of which is used. It has a waterway of some real value and still larger potential value in the Danube; it has a comfortable but invigorating climate, and sufficient rainfall for its crops. Manufacturing is moderately developed; there are 7,000 miles of railroad, but there is need for twice as many miles. There is an intense national spirit among the people and the future seems full of encouragement.

YUGOSLAVIA

This country, half the size of Germany, is made up of quite distinct parts; its official name is the Kingdom of the Serbs, Croats, and Slovenes. The former kingdoms of Serbia and Montenegro, and a number of provinces that were included in Austria-Hungary now make up the new state which has a population of some 12 millions. The country is by no means unified politically or otherwise. Its mountainous character, small proportion of arable land, and scarcity of minerals are serious obstacles to its economic advance. At the best, not over one-fourth of the land can be cultivated, and most of that must be in small tracts. About half the land is covered with forest growth, a part of which contains merchantable timber and most of which supplies wood, the principal fuel of the country. Improved roads are few and there are large numbers of secluded valleys hemmed in by mountain walls, into which people from the outside world almost never penetrate. The people are mainly peasants who occupy small farm tracts on which they raise enough for their own needs and a little more. Farming methods are crude, little machinery is used, the yield per acre is small, and the great majority of the people are poor. Corn, which can be grown more readily than the small grains on hilly, stumpy, or poorly prepared land, is the principal crop, but wheat is of nearly equal acreage (Figs. 197, 276). Such a region as the Balkan Peninsula is rather better suited to grazing than to the cultivation of crops; for cattle, sheep, and goats (Fig. 279) can find a living among the mountains, and pigs can feed on the acorns of the oak forests. The raising of animals and the exportation of various animal products is one of the country's chief sources of income.

A few million tons of coal—mostly of low grade—are mined annually, and very small quantities of a few other minerals. Manufacturing has made only a beginning, and foreign trade is necessarily small, and is carried on mainly with its near neighbors, Austria and Italy, and with Germany. The United States has relatively little trade with this part of the world. Belgrade, the capital, has over 200,000 people, and two other cities have in excess of 100,000. It is interesting to note, also, that the country has three universities, one of which is reported to have over 7,000 students.

BULGARIA

A decade or two ago, Bulgaria was one of the most ambitious of the Balkan countries, but defeat in two wars has greatly subdued the Bulgars. They joined the Central Powers in the World War and emerged from the conflict with a tremendous burden of debt, heavy loss of man power, loss of territory, and charged with a bill for indemnities that they can never pay. In its topography, climate, productions, and general economic condition, Bulgaria does not differ essentially from other parts of the Balkan Peninsula.

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CHAPTER XXXI

RUSSIA

The Overthrow of Czarist Russia.—The Russian Revolution of 1917 completely changed the economic life of Russia, and the aristocratic empire of the Czars became a soviet republic. The present Russia consists of a large number of loosely federated states extending from Leningrad to the Pacific (Fig. 280). Five independent nations—Finland, Estonia, Latvia, Lithuania, and part of Poland (Fig. 273)—have been formed out of territory that was formerly ruled by the Czars, and one province (Bessarabia) has been annexed to Rumania (Fig. 277). So far as present industries and commerce are concerned, little of permanent value can be said. It will be necessary therefore to speak mainly of those geographical features and those natural resources of Russia which are relatively permanent, and which will survive the abnormal conditions that continued for many years after the revolution.

The Chief Subdivisions of the Russian Realm.—The three major divisions of the Russian realm are (1) European Russia, (2) Russian Central Asia, (3) Siberia. The latter two, constituting Asiatic Russia, are treated at the end of this chapter which is concerned in the main with European Russia.

European Russia was in 1914 two-thirds the size of the United States, but it lost about 15 per cent of its territory in the changes that followed the World War. Since European Russia is almost wholly a plain, its natural divisions depend mainly upon temperature, rainfall, and character of the soil. From these points of view there are five natural regions which merge into one another. (1) In the far north is the *tundra* belt, where the rigors of the long winter prevent even the growth of trees. (2) South of this is a belt of forested land, averaging 800 miles in width from north to south and extending entirely across Russia from east to west. Much of this is still virgin forest, but on the southern side cutting of the timber has gone on for centuries and a considerable part has been turned into farm land. (3) In the third belt to the south, the greater part of the land is given to agriculture, but areas of forest—large and small—are numerous. This semi-agricultural belt merges into (4) the famous Black Earth region of southern and eastern Russia, essentially a prairie region resembling the Dakotas, and one of the leading wheat-growing plains of the world. (5) The region around the northern end of the Caspian Sea is arid or semi-arid and part of it is below ocean level.

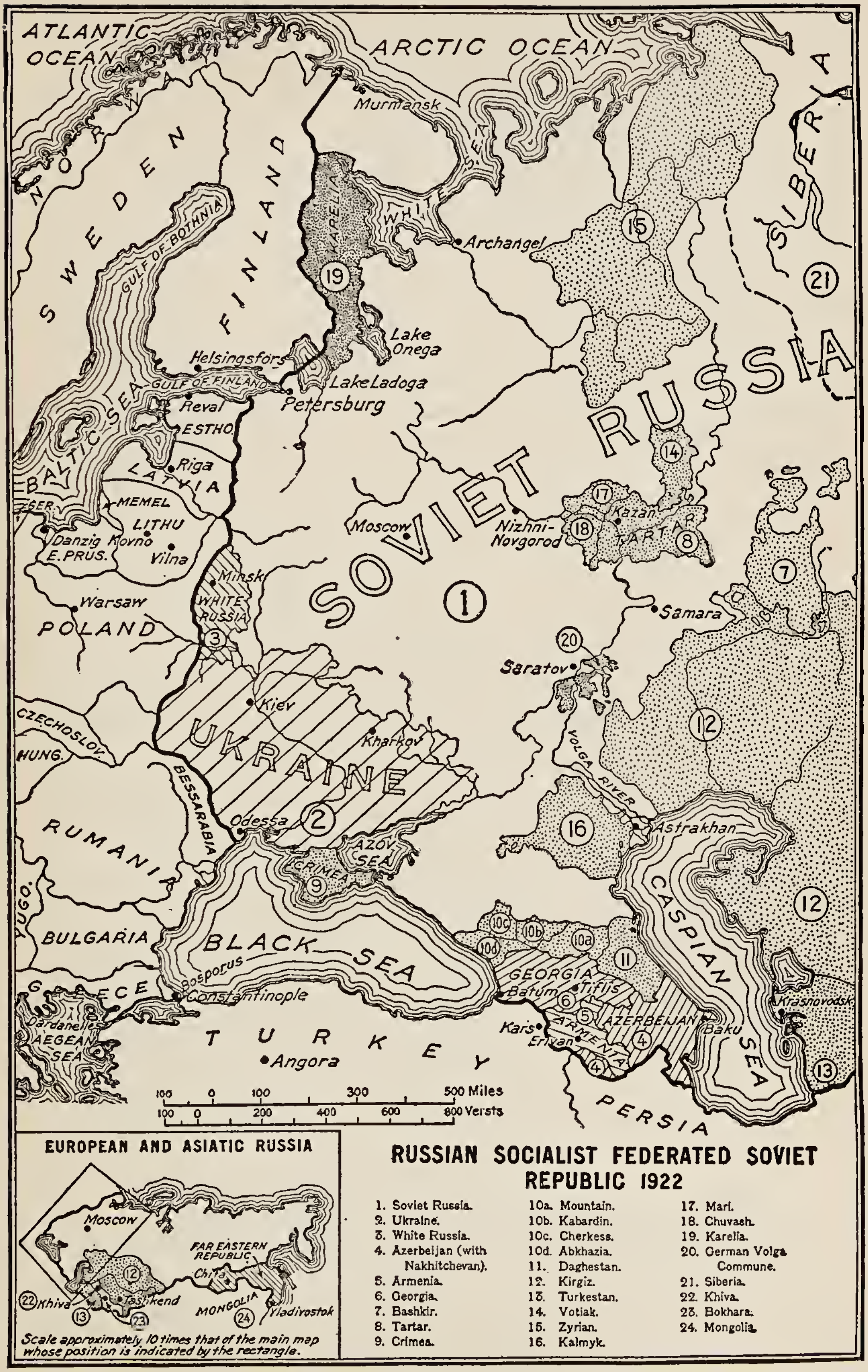
ATLANTIC OCEAN
ARCTIC OCEAN
NORWAY
SWEDEN
FINLAND
GULF OF BOTHNIA
KARELIA
19
Murmansk
WHITE SEA
Archangel
15
SIBERIA
21
Lake Onega
Helsingsfors
GULF OF FINLAND
Lake Ladoga
Petersburg
Reval
ESTHO.
BALTIC SEA
Riga
LATVIA
MEMEL
LITHU
Danzig
Kovno
E. PRUS.
Vilna
SOVIET RUSSIA
14
17
Kazan
TARTAR
18
8
Nizhni-Novgorod
Moscow
Minsk
WHITE RUSSIA
3
Warsaw
POLAND
1
7
Samara
20
Saratov
12
CZECHOSLOV.
HUNG.
Kiev
Kharkov
UKRAINE
2
BESSARABIA
VOLGA RIVER
Odessa
16
Astrakhan
RUMANIA
AZOV SEA
CRIMEA
9
CASPIAN SEA
YUGO.
BULGARIA
BLACK SEA
10c
10b
10a
10d
11
GEORGIA
Batum
Tiflis
6
5
AZERBEIJAN
4
Baku
Krasnovodsk
13
GREECE
Bosporus
Constantinople
Dardanelles
AEGEAN SEA
TURKEY
Kars
Erivan
ARMENIA
Angora
PERSIA
100 0 100 300 500 Miles
100 0 200 400 600 800 Versts
EUROPEAN AND ASIATIC RUSSIA
Moscow
FAR EASTERN REPUBLIC
Chita
12
22 Khiva
Tashkend
13
23
MONGOLIA
24
Vladivostok
Scale approximately 10 times that of the main map whose position is indicated by the rectangle.
RUSSIAN SOCIALIST FEDERATED SOVIET REPUBLIC 1922
1. Soviet Russia.
2. Ukraine.
3. White Russia.
4. Azerbeijan (with Nakhitchevan).
5. Armenia.
6. Georgia.
7. Bashkir.
8. Tartar.
9. Crimea.
10a. Mountain.
10b. Kabardin.
10c. Cherkess.
10d. Abkhazia.
11. Daghestan.
12. Kirgiz.
13. Turkestan.
14. Votiak.
15. Zyrian.
16. Kalmyk.
17. Mari.
18. Chuvash.
19. Karelia.
20. German Volga Commune.
21. Siberia.
22. Khiva.
23. Bokhara.
24. Mongolia.

Fig. 280.—Parts of the Russian Socialist Federated Soviet Republic in 1922. (*Map by Lawrence Martin in* Foreign Affairs, *an American Quarterly Review, New York, Sept. 15, 1922. Copyrighted by Foreign Affairs*).

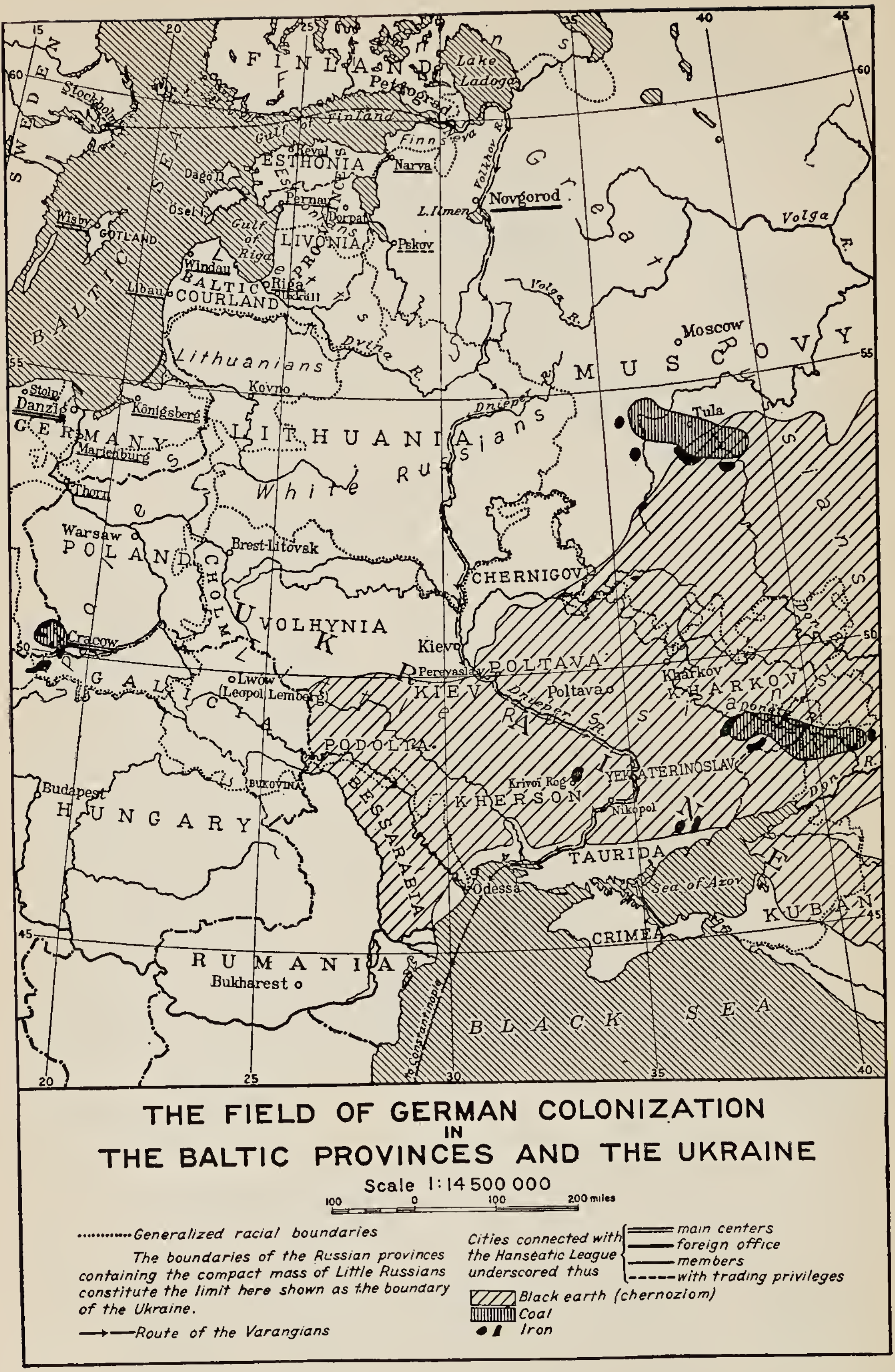
THE FIELD OF GERMAN COLONIZATION IN THE BALTIC PROVINCES AND THE UKRAINE
Scale 1:14 500 000
100 0 100 200 miles
Generalized racial boundaries
The boundaries of the Russian provinces containing the compact mass of Little Russians constitute the limit here shown as the boundary of the Ukraine.
Route of the Varangians
Cities connected with the Hanseatic League underscored thus
main centers
foreign office
members
with trading privileges
Black earth (chernoziom)
Coal
Iron
SWEDEN
Stockholm
Wisby
GOTLAND
BALTIC SEA
FINLAND
Gulf of Finland
Petrograd
Lake Ladoga
Finns
Volkhov R.
Great Russians
Reval
ESTHONIA
Narva
Dago
Osel
Pernau
Dorpat
Gulf of Riga
LIVONIA
Pskov
Novgorod
L. Ilmen
Volga R.
Windau
Libau
Riga
COURLAND
BALTIC PROVINCES
Letts
Dvina R.
Moscow
MUSCOVY
Lithuanians
Kovno
Stolp
Danzig
Königsberg
GERMANY
Marienburg
Thorn
LITHUANIA
White Russians
Dnieper
Tula
Warsaw
POLAND
Poles
Brest-Litovsk
CHOLM
CHERNIGOV
VOLHYNIA
UKRAINE
Cracow
Kiev
Pereyaslav
POLTAVA
Poltava
Kharkov
KHARKOV
Donets R.
GALICIA
Lwow (Leopol Lemberg)
KIEV
PODOLIA
Dnieper R.
YEKATERINOSLAV
Krivoi Rog
KHERSON
Nikopol
Don R.
BUKOVINA
Budapest
HUNGARY
BESSARABIA
Odessa
TAURIDA
Sea of Azov
KUBAN
CRIMEA
RUMANIA
Bukharest
Constantinople
BLACK SEA
15
20
25
30
35
40
45
50
55
60

FIG. 281.—(*From the Geographical Review, published by the American Geographical Society of New York,* 1918, *Vol.* 6, *p.* 467).

The rainfall of Russia diminishes from west to east; nearly one-fifth of the country receives less than 20 inches, and here crop failures or partial failures are not uncommon.

A Country of Great Extent and Great Natural Wealth.—Russia is the largest compact political area in the world. Only the British Empire, scattered in detached parts over the earth, has a greater extent, and only the British Empire and China have a larger population. In longitude, the Russian realm extends almost half-way around the earth. European Russia forms nearly half the area of Europe, and Asiatic Russia more than one-third that of Asia. In a country of such extent the natural wealth of soil, forests, and minerals is necessarily very great. A wide variety of crops can be raised and many kinds of raw material can be produced. Such a country can be virtually self-contained.

The Northerly Situation.—Russia, including Siberia, is a land of the far north. Its northern slope faces the Arctic, and nine-tenths of the total area lies farther north than the northern boundary of the United States. This is a fact of significance for it means that the thousands of miles of Arctic coast line is of little use for commerce because it is icebound most of the year. It means that nearly 2 million square miles of land in European Russia and Siberia, bordering on this northern ocean, is tundra, frozen solid most of the year. It means that another belt of 2 to 3 million square miles is also so far north that it is covered with coniferous forests; here the winters are long and cold, and the summers are too short to raise anything but a few quick-maturing crops. Even southernmost Russia reaches no farther south than the central United States.

The Most Extensive Plain on the Earth.—Nearly all of European Russia and half of Asiatic Russia is a vast plain less than 1,000 feet above sea level. Upwards of 70 per cent of all the lowland in the great continent of Eurasia has been brought under Russian control, and it cannot be doubted that the lowland character of this part of Eurasia has had much to do with the expansion of Russian dominion. Nowhere else in the world is there such a vast plain and nowhere else a compact national domain of such size. The absence of natural barriers made it relatively easy to push the Russian conquests on and on until a large part of the weaker peoples of Eurasia had been incorporated into the heterogeneous Russian nation. The process was still going on when the Revolution of 1917 checked it. But a country of such great extent has its disadvantages; it means that a large part of the country must be far from the sea and far from the markets of the world, and this in turn means long and expensive rail hauls to get the products of the interior to markets. The western half of Siberia has large agricultural possibilities, but there is a long overland journey to get its products to the densely peopled parts of the earth where they are wanted.

Climatic Conditions.—The "cold pole" of the earth is in northern Siberia where the average January temperature is about 60°F. below zero. In nearly all of Siberia the average January temperature is below zero. European Russia is less continental in its climate; for example, Moscow in central Russia has winter and summer temperatures similar to those of Minneapolis. In the southern half of European Russia the summers are hot and the winters are reasonably mild. Russian Central Asia is subtropical in the south and grows cotton and fruits under irrigation. Rainfall is light in European Russia because the prevailing westerlies lose much of their moisture before they reach the interior of the country. On the whole, then, Russia is a country of deficient heat and light rainfall. Notwithstanding this, in a country of such size there is a great extent of productive agricultural land.

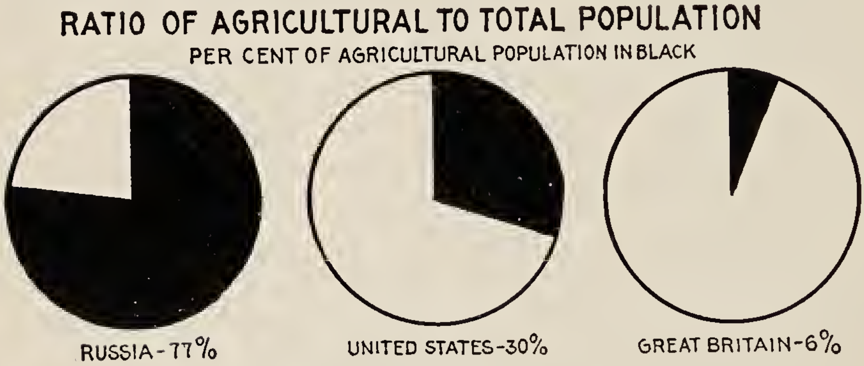

FIG. 282.

The Lack of Open Ports.—One of the most significant facts in the geography of Russia is the lack of ice-free ports on the open sea. With all its great length of seacoast, Russia has not been able to acquire a first-class harbor. The Arctic coast is closed by ice a large part of the year; the Pacific coast is a little better; yet only one port, Vladivostok, is kept open throughout the winter, and that by the use of ice-breaking steamers. The Baltic is open the greater part of the year, but other nations control the narrow channels that lead into it, and in time of war it is easily closed and becomes useless to Russia, as was the case during the World War. The one and only warm water outlet for Russia is through the Black Sea, whose narrow outlet is controlled by a foreign power, and during the World War this outlet was closed against Russia. In spite of the vast size, great wealth, and enormous man power of the Russian Empire, its effectiveness in war is greatly reduced by the difficulty it encounters in getting needed supplies from the outside world. The old Russian government felt most keenly the lack of open ports, and the world knew that such an ambitious nation would not rest content until the open sea was reached. The new Russia is yet too weak to renew the struggle for open ports, but if Russia again becomes a great power, that struggle will surely be renewed.

The Great Forest Resources.—It is believed that Russia has a greater extent of forests than any other country, though a considerable part of them contains little merchantable timber, due to the very cold climate in which they grow. About 40 per cent of the entire land area is forested, mainly with conifers. European Russia alone has a forested area of about 700,000 square miles, or 3½ times the total area of Germany; and eastern Siberia has a forested area of about the same extent. The old Russian government owned nearly a billion acres of timber land. Prior to the Revolution of 1917, Russia was exporting large quantities of lumber and timber from the White Sea region, whence the timber is marketed with difficulty because it must be brought out from the Arctic coast. The vast forests of the Amur River basin in Eastern Siberia will be a great future source of timber for the Far East. On the whole, Russia's forests are one of its large sources of natural wealth.

AGRICULTURE

Predominance of Agriculture in the National Life.—Russia is emphatically agricultural, the most completely so of any of the large European countries. More than three-fourths of the people are peasant farmers or farm laborers. The vast majority of the people are more interested in the land and in the problems growing out of the distribution of land, its utilization, ownership, and taxation, than in any other problems. The Revolution of 1917, which greatly changed all economic conditions, was partly due to the poverty, oppression, and consequent discontent of the peasants. Probably a main reason why Russia has survived the Bolshevik rule so long has been the training that 80 per cent of the people had in supplying for themselves most of their simple wants. Russia has enormous agricultural possibilities in its great extent of land, and in the natural fertility of the Black Earth region. Less than 25 per cent of European Russia is under cultivation, yet even this is an area greater than the *total* area of France, Germany, and England combined. A great amount of potential agricultural land is still forested, and extensive regions both in Russia and in Siberia, now unused, will eventually be brought under cultivation.

Mainly Hardy Crops Are Grown.—Russia's northerly situation restricts agriculture in the main to crops that can mature in rather short, cool summers, although corn is grown somewhat in the south (Fig. 276). Oats and rye are the two outstanding grains for home consumption, and the production of each has run well toward a billion bushels a year (Fig. 283). Russia probably has more horses than any other country, which in part accounts for the great demand for oats. Rye bread is the staple food of the peasants, as it is in many countries of Europe. Prior to 1914, one-third of the barley of the world was grown in Russia, mainly in the south, and large quantities were exported. Both spring wheat and winter wheat are grown (Fig. 197), and the annual production in the old Russian Empire reached nearly a billion bushels.

In the production of potatoes (Fig. 232) and sugar beets (Fig. 233) Russia usually ranks second only to Germany, and in the two fiber crops—flax and hemp—the country led the world.

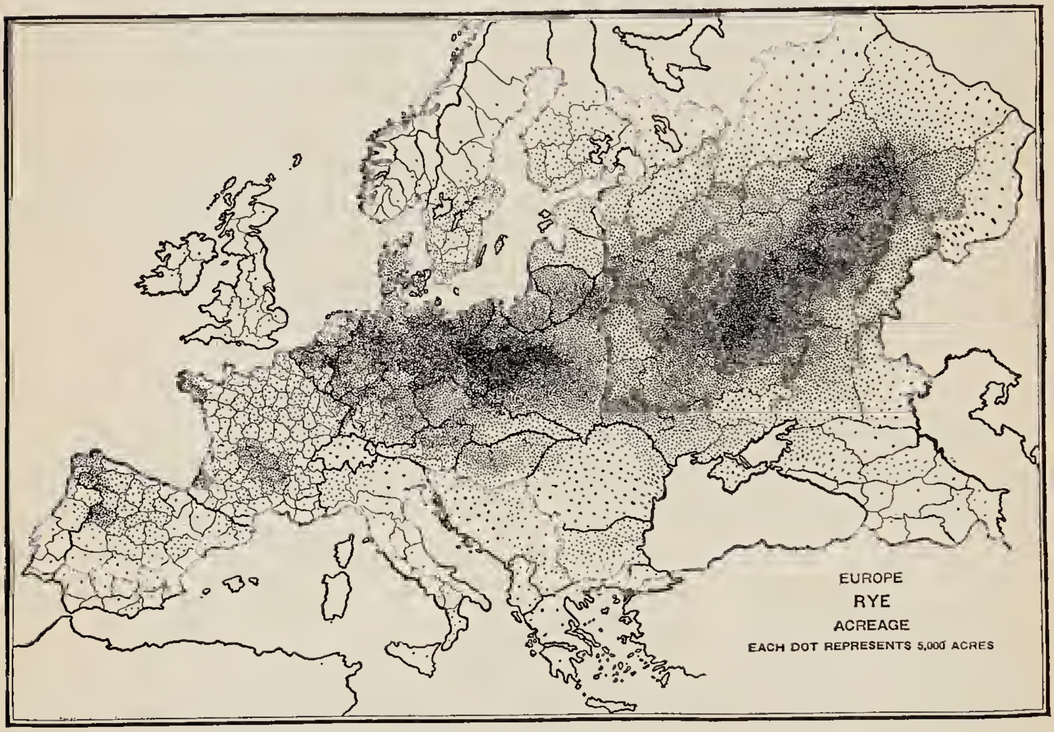

Fig. 283.—The rye belt of Europe lies on the cooler and more humid side of the wheat belt and also in regions of poorer soil. (*U. S. Dept. Agr.*)

Backward Farming Methods.—In its methods of agriculture Russia is deplorably backward; the greater part of the peasants are illiterate and very poor. They neither know how to get the best out of their land nor have they had any means of learning. In the old days the large estates were, as a rule, managed intelligently, and yielded on an average 50 per cent more per acre than the peasants' lands. On these estates modern machinery was used, but the peasant is too poor and has too little land to permit the use of machinery. Much land is allowed to lie fallow every year to "give it a chance to rest." Fertilizers are little used, and in places the communal ownership of land has worked against any effort to improve it. With the rapid growth of population, there came repeated subdivisions of the land until the amount allowed each family was too small to support it, and large numbers had to migrate to Siberia and elsewhere. The yield per acre was about the lowest among the agricultural countries, and was only one-fourth or one-third that in such countries as France and Germany. Only through its great extent of farm land does Russia hold a high position in food production. So small is the income of the peasant's family that its plane of living is pitiably low and its purchasing power correspondingly low. The American farmers with their numerous and expensive farm machines, their telephones, automobiles, well-furnished houses, papers and magazines, and their children in high school and college would seem like a landed aristocracy to the peasant farmers of Russia.

The Bad Land System.—The system of land ownership before 1917 varied in different parts of European Russia, but almost everywhere it was economically bad. The crown and nobility held about 38 per cent of the total land, a large part of which was forested. The landed gentry held about 15 per cent, mainly in large estates. About 30 per cent had been allotted to peasants or to the villages whose inhabitants held the land in communal possession. A family might temporarily hold several strips of land quite widely scattered, working them for a few years only and then being required to turn them over to another family and receiving a different allotment, which in turn was passed on. This *mir system* necessarily led to deterioration of the land, for no one cared to improve land which was soon to pass to some one else. Only about 4 per cent of the land was privately owned by individual peasants. After the Revolution all this was changed. The land of the royalty and gentry was seized and the peasants took forcible possession. An attempt was made by the Soviet government to nationalize all land and hold it as the property of the state, but the peasants refused to accept this plan and demanded the right of individual ownership. Production of crops declined to less than half of the pre-war period, and a great food shortage resulted. More recently the soviet officials have given the farmer greater freedom of action and the production of foodstuffs has increased; but there is little surplus, and in regions extreme poverty still prevails. Agricultural exports are scarcely one quarter as large as they were before the soviet government was set up.

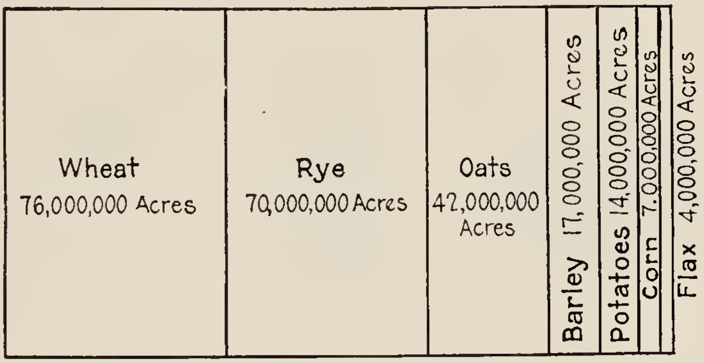

Fig. 284.—Acreage of the chief crops of Russia, 1927.

Mineral Resources

Coal and Iron in European Russia.—The best coal of Russia is in the Donetz Basin in the south (Fig. 281). A moderate amount of coal is mined near Moscow and also in the Ural Mountains, but in quality and quantity the Donetz coal fields are the outstanding fields of European Russia, though the reserves are not especially large. There are reported to be in this region from 25 to 40 workable seams of coal, including coking coal and semi-anthracite. The mines are not far from the sea, and in the future they are likely to become a source of supply for the Mediterranean lands, most of which are deficient in coal. Russia has not reached the stage of development which calls for large quantities of coal and iron for manufacturing purposes, and the country, even under normal conditions, used less than 3 per cent of the coal output of the world as compared with about 40 per cent used by the United States.

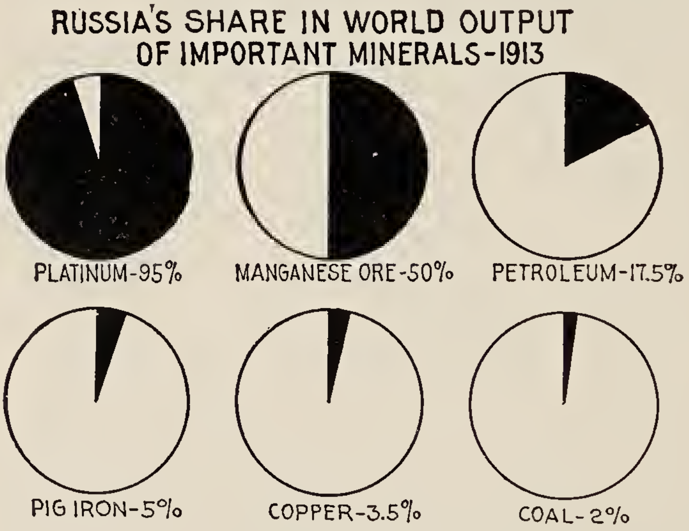

Fig. 285.

Russia's production of iron ore is very small, less than one-half as great as it was before the revolution. The chief iron mines of the country are in the south and are not far from the Donetz coal fields (Fig. 281). These ore bodies are of high quality, ranking with those of Sweden, and are superior to practically all the other iron ores of Europe (Fig. 200). The high quality of the ores, their proximity to coking coals, and the location of both in the most temperate part of European Russia are facts which will make possible the future expansion of Russian iron and steel industries. In 1913, the last normal year, Russia produced about 5 per cent of the iron of the world, against 36 per cent in the United States (Fig. 285). This comparison indicates the relative backwardness of Russia in industrial matters.

Russia a Large Producer of Petroleum.—At one time (around 1900) Russia was the world's leading producer of petroleum, and the Baku oil field, near the Caspian Sea, was for a long time the largest single producing field of the world. All the Russian petroleum is obtained from fields in the southern part of the country in the Caucasus region, but the Baku field yields about 75 per cent of the total. In 1928 Russia produced 6 per cent of the world's supply, and held third rank as an oil-producing nation, following the United States (70 per cent) and Venezuela (8 per cent). A pipe line 560 miles in length connects the Baku field with Batum, a port on the Black Sea whence the oil is sent to various ports of Europe. The entire petroleum industry has been nationalized, and the output is now nearly as large as it was in 1901, the banner year of production.

The Precious Metals. *Platinum.*—The most valuable mineral that is used at all commonly is platinum; it is several times as valuable as gold ounce for ounce. It is essential in certain chemical and electrical processes, but the major part of it is now used for jewelry. Prior to the World War, about 95 per cent of the annual supply of platinum came from the Ural Mountains in Russia, and most of the other 5 per cent came from Colombia, in South America (page 284). Since the war, the Russian output has not regained its former importance, while that of Colombia has increased notably. The Ural deposits of platinum are practically all in river gravels and are mined by washing, in the same way as placer gold deposits.

Gold.—Before the break-up of Russia, it ranked fourth as a producer of gold, but nearly all of this came from Siberia. The country still holds fourth rank in gold production, following South Africa, the United States and Canada.

Manganese.—It has already been pointed out that manganese is used in large quantities in making steel either by the open-hearth process or by the Bessemer process (page 188). Every ton of steel thus made requires about 14 pounds of manganese. Since practically all the steel made in the United States is made by one or the other of these two processes, it follows that this enormous steel industry, the most fundamental of manufacturing industries, requires thousands of tons of manganese yearly. Prior to 1914, the Caucasus region of Russia supplied half the world's manganese, and British India supplied most of the remainder (Fig. 285). At present, India leads and Russia holds second place. An American company worked the Russian manganese mines for a while after the World War, but found them unprofitable and surrendered the concession. On the whole, the production of minerals in Russia has never even approached the possibilities, because of lack of enterprise, remoteness from great industrial centers, and the general backwardness of the country.

Manufacturing and Commerce

Manufacturing Inadequately Developed.—A high development of manufacturing belongs to the later stages of a nation's economic growth. Some nations develop rapidly, as the United States and Japan have done; others develop slowly, as Russia has done. Modern manufacturing requires highly trained engineers, chemists, financiers, and business managers; it calls for expert direction, skilled labor, wide knowledge of sources of raw material and of markets—in short, a great body of skilled and highly trained men. Moreover, extensive manufacturing requires the best of transportation facilities and large amounts of capital.

The Russian government is not financially able to provide general and technical education. It does not prepare a sufficient number of men capable of conducting modern industrial enterprises. Much of the manufacturing that was done in Old Russia was under foreign management, especially German, English, and French. A large part of the manufacturing in Russian Poland, for example, was done by German companies. However, in the twenty years preceding the World War a great deal of industrial progress was made in Russia. The government had a definite policy of making the country independent of imported manufactures. A high tariff on imports was adopted and laws were enacted to encourage manufacturing. The growth was most notable in (1) Poland, (2) the Ukraine, and (3) Moscow and vicinity. Each of these regions has coal, and all are in sections which had good transportation facilities. Household and village industries still prevail throughout the larger part of Russia. Factory production of manufactures probably did not exceed $25 per capita in 1914, and is much less under the soviet régime; in the United States the output of manufactures per capita of the population is $500 to $600 a year. In keeping with its desire to nationalize all industries, the soviet government is trying to operate most of the manufacturing industries but has not been very successful.

The Importance of Fairs.—In the Middle Ages fairs were the prevailing means of bringing buyers and sellers together. Means of transportation were exceedingly poor in most parts of Europe, and the rapid, constant flow of goods with which we are familiar did not exist. In place of the fixed mercantile establishments so numerous in our cities and towns today hundreds and even thousands of fairs were held annually. To these fairs merchants and others who had articles to sell or barter took their goods, and there seller and buyer came together. Prior to the World War, and to a lesser extent since, this practice has prevailed in Russia. The greatest of all Russian fairs was held annually at Nizhni Novgorod on the Volga in the heart of European Russia. Since the Volga is the principal interior waterway of the country, it was to be expected that the largest and most persistent of the fairs would be on its banks. The fair continued from July to September; tens of thousands of people attended it and a hundred million dollars' worth of goods changed hands in a good year.

At Irbit in the northeast was held the great annual fur fair at which furs were assembled from almost the whole Russian realm. Russia is a land of horses and in the past as many as 5,000 horse fairs a year were held in the country. All Russian fairs have declined in importance.

Small Foreign Commerce.—For four main reasons the foreign trade of Russia is very small. (1) The vast extent of the country and great diversity of products make it possible to supply most of the necessary foodstuffs, building material, fuel, and raw materials from home sources; (2) the widespread poverty of the masses prevents their buying imported goods to any extent; (3) most things are produced by unscientific and inefficient methods and the production per man is small; (4) other peoples appear to have little faith in the soviet government and little desire to have business relations with it.

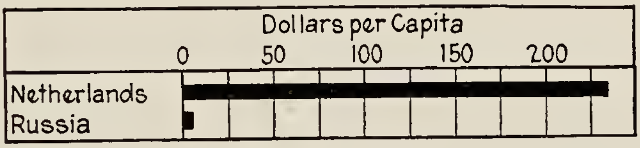

Fig. 286.—Comparison of the foreign trade per capita of the population in Netherlands and Russia, 1927.

Contrary to the case in most European countries, Russia formerly sold abroad more than it bought, but this is no longer true. Even such little countries as Belgium and the Netherlands have more than twice the foreign trade that soviet Russia now has, and the per capita trade of Belgium is nearly 50 times that of Russia.

However, small as it is the foreign commerce of Russia is increasing considerably. Wheat is the leading export. Furs, lumber, petroleum products, barley, and flax are other important exports. Among Russia's great needs are machinery, railway equipment and other equipment for carrying on her productive industries. Although the United States declines officially to recognize the Russian soviet government, yet only Germany sells more goods to Russia than does the United States.

Asiatic Russia

SIBERIA

Character of the Country.—Siberia is much larger than Europe, but has only a small and scattered population, most of which is rural. It lies in the same latitude as Canada, but owing to its extreme type of continental climate, the winter temperature is colder than it is in corresponding latitudes in Canada; in fact, the coldest known place in the world is in northern Siberia. North of the Arctic Circle the region is almost wholly tundra, frozen swamp land upon which practically nothing can grow except during a month or two in midsummer. South of the tundra belt is the coniferous forest belt, estimated to include 470,000 square miles of merchantable timber. However, about two-thirds of this forest land is of no present commercial value for the timber cannot be reached by any existing routes of transportation. The forests of the Amur basin in the far east of Siberia will probably be the chief future source of timber for eastern Asia.

Western Siberia is a continuation of the great plain of European Russia and is the principal agricultural region of Asiatic Russia. Its nearness to Europe permits the settlers to market their products at a moderate cost for transportation, which is not true of the rest of Siberia. The great economic problem in the development of this vast Asiatic realm will always be the cost of getting its products overland to ports, or to markets which are thousands of miles away (Fig. 287). The steppe region of western Siberia is the home of various nomadic tribes that keep large numbers of cattle, sheep, goats, horses, and some camels.

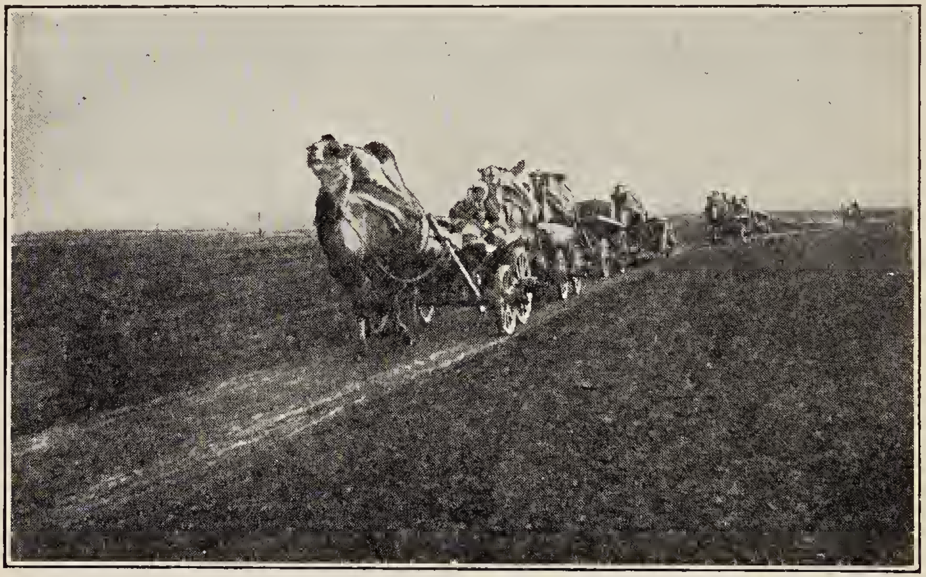

Fig. 287.—Marketing wheat in Western Siberia. (*U. S. Dept. Agr.*)

Eastern Siberia is extremely mountainous, but is known to contain valuable minerals and is believed to be very rich in these minerals. Three great rivers (Ob, Yenisei, Lena) flow from south to north across Siberia and with their tributaries furnish thousands of miles of river navigation which, in such a country, is of utmost advantage in the movement of products. On these three rivers and the Amur in the east there were, in pre-war days (1914), some 900 steamers.

The People.—The *native* peoples of Siberia number between 1 and 2 millions, less than 20 per cent of the total population of 10 or 12 millions or an average of only two persons to the square mile; yet in fully half of Siberia the average density is much below this. Most of the Russians in Siberia are in the western provinces and along the Siberian Railway. They or their ancestors went there as exiles or as emigrants, many of them seeking to escape the hopeless conditions in European Russia. Cities of 100,000 or more people (Omsk, Tomsk, Irkutsk) have grown up, and the conditions of settled agricultural and town life exist in limited parts of the vast area.

The Products.—The tundra and forest belts supply only one significant item of international commerce—furs; these are mostly bartered to traders by the uninformed natives who know little of their real value. Along the Siberian Railway and its few branches and near the great rivers, agriculture is carried on in a crude way by the agricultural colonists, most of whom have entered Siberia from Russia. The major part of the cropped land is in western Siberia, but the total cultivated land in all Siberia is placed at about 40,000 square miles, or less than the total area of a state like Ohio. Wheat, butter, hides, and fur skins are the principal items that reach the outside world from Siberia.

Gold has long been mined in Siberia—mainly in the valleys of the eastern provinces, and 75 per cent of all of this metal that was mined in Russia in pre-war days come from this region. Most of it was obtained by placer mining done by the exiles who were sent from European Russia to Siberia. Coal, iron, salt, and many other minerals are abundant but are not mined in large quantities, for the country and its means of transportation are too backward to permit extensive mining operations except in gold. Most of the Siberian products that reach the outside world are obtained along the Siberian Railway or are brought to it on the navigable rivers which are crossed by the railway.

RUSSIAN CENTRAL ASIA

This extensive region of low rainfall, exceeding a million square miles in area, was one of the more recent additions to the Russian Empire. It is now loosely federated with the other soviet republics which form the present Russia, but only a small fraction of the 9 million people are Russians. Between Siberia on the north and Turkestan on the south are the steppe regions already mentioned (page 464) as occupied by nomadic tribes that keep great numbers of sheep, goats, cattle, and other animals. Over half of Turkestan is desert; about 40 per cent of the land raises sufficient grass to form thin pasturage, and about 4 million acres are under irrigation. The irrigated "oases" raise most of the crops, which consist of wheat, barley, millet, fruit, and other foodstuffs, practically all of which are used by the inhabitants. There are three products of considerable importance which reach the channels of international trade; they are cotton, silk cocoons, and the skins of the Astrakhan lamb (karakul) of which 1½ million a year were exported some years ago. At times nearly half of the irrigated land has been devoted to cotton and most of the million bales were shipped to Russian cotton mills. Two Russian-built railways enter this region, and prior to 1917 they were aiding very materially in the economic development of Turkestan, but after the adoption of soviet rule, all industry declined greatly. There are a few cities of good size; for example, Bokhara and Tashkent, centers of ancient caravan trade which have from 100,000 to 200,000 population. There is almost no manufacturing in which machinery is used, and almost no contact with the outside world beyond the bordering countries. The famous Oriental rugs which in limited numbers come from Turkestan are probably the most characteristic of the manufactured products.

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CHAPTER XXXII

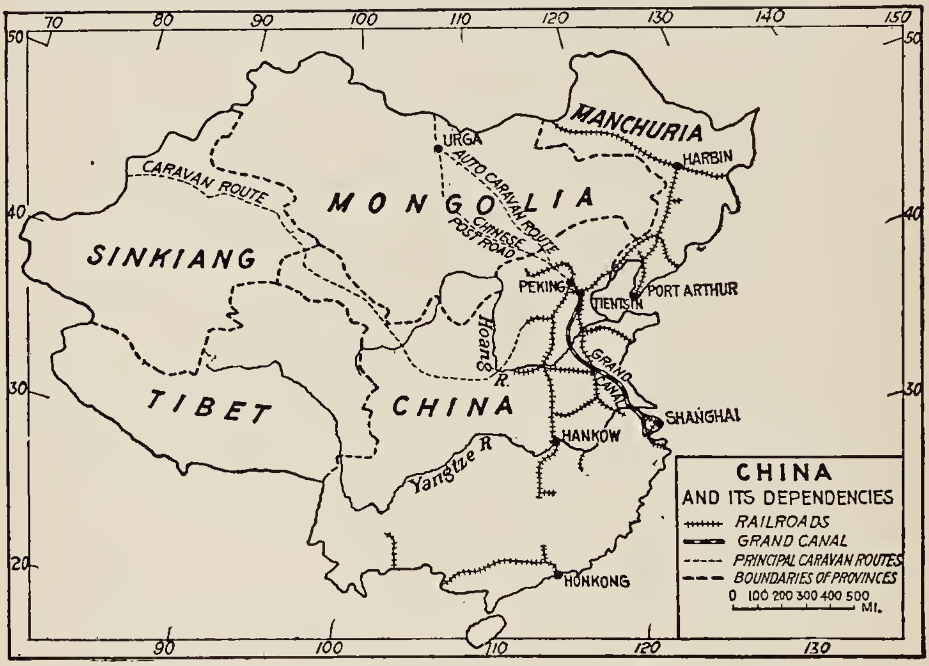
THE CHINESE REPUBLIC

The Influence of China's Long Isolation.—Of all the nations of the earth, China is believed to be the oldest. Its history extends back 4,000 or 5,000 years, and during most of that time the Chinese had little or no contact with any peoples who were their equals in civilization. By many wars they pushed their boundaries outward until the impassable barriers of deserts, mountains, lofty plateaus, and the sea were reached. These barriers were so effective that the Chinese remained virtually unknown to Europeans until a few hundred years ago, and relatively little was known of them until after 1840.

In 300 B. C., the Chinese had reached a stage of comparatively high civilization. They discovered the use of the mariner's compass, invented printing by movable blocks, and somewhat later invented gunpowder. They finished the great Chinese Wall, 2,000 miles long in 211 B. C. At about this time China produced the greatest minds of all her history; among these was Confucius whose teachings have had a tremendous influence upon all subsequent Chinese history. He taught the people a deep reverence for their ancestors and for the past, and this backward-looking attitude, coupled with the geographical isolation of the country, checked Chinese progress for 2,000 years.

Conditions since 1840.—Since 1840 China has had three wars with European nations and a war with Japan, in all of which she was quickly and easily defeated. In 1911–12 a revolution took place; the Manchu rulers of China were overthrown and a republic was set up, but it has had a stormy history. The central government was unable to enforce its authority. Banditry, local outbreaks, overthrow of high officials, and general lawlessness were more or less common. At length, the South Chinese set up a revolutionary government, organized a strong army, and moved northward, finally taking Peking and assuming the rule of all China (1928).

Old China and the Four Dependencies.—Eighteen provinces in the southeastern part of the country make up China proper, which is half the size of the United States, but contains over 80 per cent of the total Chinese population of between 350 and 450 million people. Here are the great flood plains of the Yangtze and Hwang rivers with their teeming millions of industrious workers, hundreds of walled cities, and thousands of walled villages. The outlying dependencies are Manchuria, Mongolia, Chinese Turkestan or Sinkiang, and Tibet (Fig. 288). Mongolia, at the north, is a plateau with great stretches of desert and a very sparse nomadic population. The northern part called Outer Mongolia, has come under Russian Soviet influence and is no longer held as a part of China. Sinkiang, in the west, is a region of deserts, mountain ranges, great interior basins, and few people. Tibet, in the southwest, is the loftiest plateau in the world, most of it upwards of 12,000 feet above sea level. It is penetrated with great difficulty, and until recently its officials refused to permit foreigners within its borders. It is more populous than Mongolia or Turkestan, yet it has little trade with the outside world, and few foreigners have ever been in the country. English influence is reaching northward from India and is gradually replacing Chinese influence.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MANCHURIA
HARBIN
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CARAVAN ROUTE
MONGOLIA
SINKIANG
PEKING
TIENTSIN
PORT ARTHUR
Hoang R.
GRAND CANAL
SHANGHAI
TIBET
CHINA
HANKOW
Yangtze R
HONKONG
CHINA
AND ITS DEPENDENCIES
RAILROADS
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BOUNDARIES OF PROVINCES
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FIG. 288.—China proper, the outlying dependencies, and the principal traffic routes.

Manchuria, larger than France and the British Isles combined, is the most valuable of the dependencies of China; about 98 per cent of its 20 million people are Chinese. Lying in the latitude of Minnesota and Manitoba, and having 20 million acres of excellent farm land, it is a valuable possession. Since Japan's victory over Russia in 1904, Japan has been getting an ever firmer hold upon southern Manchuria, through the complete control of the South Manchuria Railroad and its commercial terminal at Dairen. Manchuria has valuable deposits of coal and iron, some of which are being developed by the Japanese. Along the line of the South Manchuria Railroad, due to Japanese energy, towns and cities are springing up rapidly and new industries are being established. While only 1 per cent of the people of Manchuria are Japanese, about 10

llent farming land.

uable deposits of coal & iron

per cent of the city dwellers of South Manchuria are Japanese. Owing to the rapid progress that is going on, large numbers of Chinese are leaving the congested parts of old China and are going to Manchuria where conditions of living are more favorable.

The northern and eastern part of the province is heavily forested, and along the rivers extensive lumbering operations are in progress; 60,000 men are employed along the Yalu River; 5,000 to 7,000 log rafts descend the river every season, and there are over 20 saw mills in Antung, at the mouth of the river.

The Soy (Soya) Bean.—Southern Manchuria is a good agricultural region, producing four main crops more or less in rotation. Commercially the most important of all is the soy bean of which there are many varieties. Manchuria leads the world in the production of this valuable crop; 5 million acres are devoted to it, and upwards of 100 million bushels of beans are produced yearly. It is said that "in value, and in extent and variety of uses, the soy bean is the most important legume grown in Asiatic countries." Like other legumes, its roots add nitrogen to the soil. The beans are rich in oil and in protein; by grinding and pressing, oil is extracted, and the bean meal, made into bean cake, is a most excellent cattle feed and fertilizer. (Japan uses upwards of a million tons of Manchurian bean cake annually mainly as a fertilizer.) The oil is put to many uses; as a cooking oil, as a substitute for linseed oil in paints, as a fat for soap-making, and many other purposes. From the beans "soy bean milk," similar in appearance and properties to ordinary milk, is made, and from it, soy bean curd, and soy bean cheese are made. All these products are much used in China and Japan and the oil is imported into the United States in large quantities.

oil
protein
soy bea
milk

The Importance of the Monsoon Climate.—The monsoon type of climate is not confined to southern and eastern Asia, but is most perfectly developed there, and there its effects are most clearly manifest. In winter the prevailing winds are from the continent and are dry, bringing very little if any rainfall. During the summer the prevailing winds blow from the ocean and bring frequent and heavy rains. (The effect of these rains upon agriculture is remarkable, for they come at the season when they can do the most effective service to crops.) Nearly one-half of the population of the earth lives in the monsoon lands and the great majority live by agriculture. In this connection it may be pointed out that man has not made much progress where climatic conditions are quite uniform the year around, as they are in the tropics. A marked change of seasons—especially the alternation of a productive with a nonproductive season—has taught man the necessity of providing in the season of plenty for the season of scarcity. It teaches the value of forethought and leads to the habit of laying up something for a time of need.

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Sections of China Proper

North China corresponds in latitude to our northern states. The winters are dry and cold, often bitterly cold, with piercing dust-laden winds driving down from the bleak Mongolian plateau. The people of this section are larger and more robust than those of south China. The summers are hot and the rainfall is usually, though not always, adequate for crops. The terrible famine of 1920 to 1921 in this section of China was mainly due to the failure of rain two years in succession. The most valuable coal fields of the republic are in north China. While not the richest or most populous section of China, it long held a preponderant influence in the government, but lost this in 1928.

Middle China includes the basin of the Yangtze River and is the most productive and most populous section of the country; it has half the total population and a long list of important cities, including Shanghai, the chief port of China; Hankow, the leading industrial and commercial center of the interior; and the majority of the treaty ports, or ports open by treaty to foreign commerce. Through the middle of this intensively cultivated region flows the great waterway of China, the Yangtze. Here the climate is milder than in the north and the rainfall more ample and more certain. It is a region of rice, silk, tea, and cotton, the great agricultural staples of the country.

South China is mountainous. In climate it is semitropical and tropical; the people are smaller of stature and less muscular than those of the north toward whom they are none too friendly. A great many of the people are not of Chinese stock and are accordingly less easily governed by Chinese officials. The valley of the Si or West River, with the large city of Canton near its mouth, is the best part of South China. Nearby is the important commercial port of Hongkong.

The Great Rivers of China.—Two of the great rivers of the world are in China. The Hwang or Yellow River is little used for navigation because of its many rapids and sand bars. It flows through a part of China that is deeply covered with a yellow wind-blown soil, called *loess*, and the water of the river, which always carries more or less of this, gives the name (Yellow) to the river and to the sea into which it empties. The river is subject to disastrous floods and at times great numbers of people are drowned, over a million in 1878, for example. The alluvium deposited by the overflowing waters has built up a flood plain thousands of square miles in extent, very fertile and very densely populated. The lower part of the river has changed its course—first north then south of Shantung Peninsula—thirteen times in the last 25 centuries.

Much more important to China is the Yangtze, the most used waterway of the nation. It, too, has an extensive flood plain which on the north joins with that of the Hwang. The Yangtze is the main highway

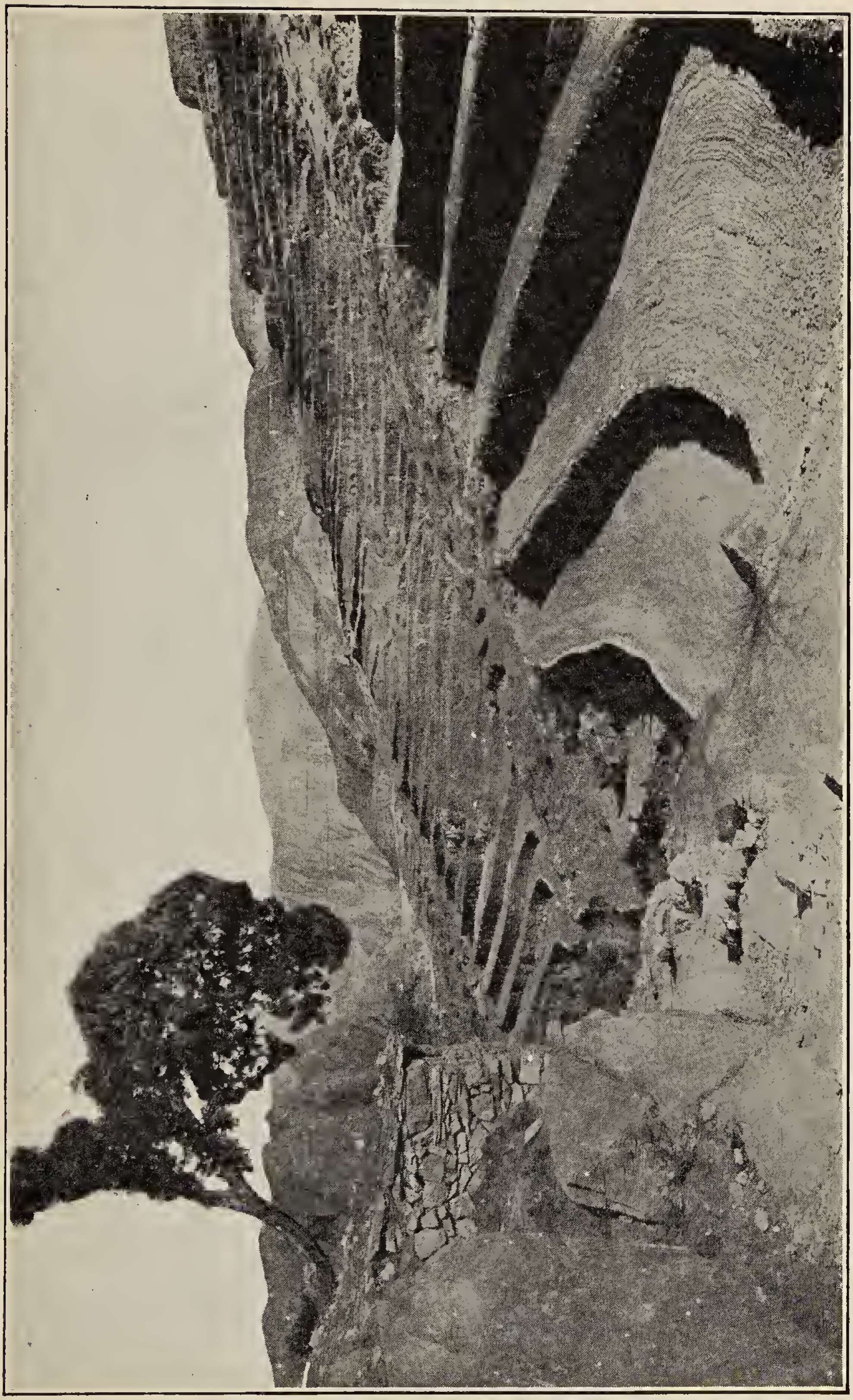


FIG. 289.—Terraced land in North China. Saving what is left of the soil after the forests are gone. (*Photo by U. S. Forest Service.*)

to and from the rich interior of China and it carries an enormous amount of traffic, the most, in fact, of any long river in the world. Ocean-going vessels of large size can ascend 800 miles to Hankow, one of the most important cities of the Republic, often called the "Chicago of China." River steamers ascend 400 miles farther to the series of dangerous rapids where the river cuts through lofty mountain ranges. Peculiar river boats towed by 50 to 100 coolies, or modern motor boats, carry freight through the rapids, above which is another stretch of safe water.

The Network of Canals.—On the flood plains of middle and south China is a system of canals that has no equal anywhere else in the world. The canals serve three quite different purposes—irrigation, drainage, and transportation. In his "Farmers of Forty Centuries," Professor F. H. King tells of traveling a distance of 117 miles on one of the canals and counting 324 branch canals extending off on either side. On a railroad journey of 162 miles he counted 593 canals from the train, or more than 3 per mile. His computation shows 25,000 miles of canals in an area half the size of Illinois. These canals are almost the only highways of the region and are alive with boats propelled by poles or by a long oar projecting from the stern.

Inadequate Routes of Transportation.—In scarcely any other respect is China so far behind as it is in facilities for modern transportation, and there is no other deficiency which so retards development. Most of the people in China never saw an improved highway. In north China are certain roads over which it is at times possible for wheeled vehicles to pass, but such roads are few and poor. Most of the transporting is done by pack animals, by wheelbarrows, or on the backs of men. In Manchuria the moving of crops is largely done after the ground freezes in the late fall or winter. Then the Manchurian carts drawn by horses, mules, oxen or ponies—or even all of them in one team—can be used. The cost of such transportation is about 25 cents per ton-mile, or ten times as high as the rates on American railroads. Men with wheel-barrows, often very large and heavy, move freight and even passengers hundreds of miles at the rate of about 30 miles a day. In south China goods are commonly carried in baskets hanging from either end of a pole resting on the shoulder of the porter. Even lumber and heavy timbers are carried long distances overland on the backs of these sturdy men who earn perhaps 25 to 30 cents a day and provide their own food. Yet such transportation is far more expensive than railway transportation in the United States.

Railroads in China date from 1876. The first two short roads built were purchased by the authorities and torn up because of superstitious fears on the part of the people. In all China there were by 1928 nearly 9,000 miles of railway, mostly owned by the government or by foreign corporations. All economic progress in China waits on railroad building, and China has neither the capital nor the credit to build railroads rapidly (Fig. 288).

The Importance of Agriculture.—Several factors have combined to make and keep China an agricultural nation: (1) the abundant summer rainfall combined with the warm or subtropical temperature which prevails over the southern half of the country; (2) the great fertility of the river flood plains; (3) the skill in agriculture acquired by centuries of practice, together with the absence of knowledge of mining and machine manufacturing; (4) the tendency of each locality to seek self-sufficiency in food production because of poor transportation; (5) the fact that in the past agriculture ranked first in honor among occupations.

Outside the cities almost everybody tills the soil and many of the men who work in the cities or act as porters or work at odd jobs part of the year, cultivate little farms the rest of the year. It is probable that 80 or 85 per cent of the people are wholly or partly engaged in agriculture. They are a wonderfully patient and industrious people, working long and hard, uncomplainingly, even though they are able to get little more than a bare living at the best. The farms are small (2 to 5 acres) and are worked almost wholly by hand. There are few work animals and practically no farm machinery. Every bit of fertilizing material that can be secured is carefully conserved and applied to the land; mud is dipped up from the canals and spread on the soil; hillsides are terraced and soil is sometimes carried in baskets up to these terraces. Often two or three crops are secured yearly from the same land. Pigs and poultry are common, but other farm animals are scarce.

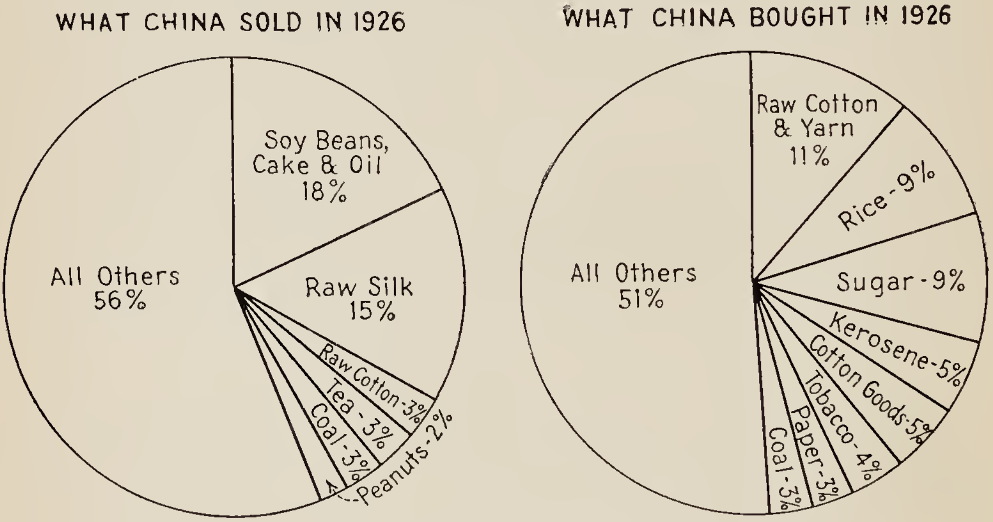
The greater part of China is mountainous, and it is estimated that only about 180 million acres (equal to six central states of the United States) are actually cultivated intensively. Farm labor is abundant and cheap, averaging less than 25 cents a day.

Crops.—Rice, the food crop of south and middle China, is the daily and principal food of at least a hundred million Chinese. In the north of China and in Manchuria, wheat, soy beans, and the grain sorghums are more important food crops than rice. Throughout China corn, and many of the other grains, and great quantities of vegetables are grown. In cotton production China ranks high; tea is still important, but declining, and in silk culture China is second only to Japan. Most of the food is required at home, but certain items are sent abroad, notably silk, soy beans, and tea. Of late, the United States has been buying increasing quantities of Chinese products.

nd. to
an in silk
culture

Rice Culture.—The monsoon lands, including Japan, India, Siam, the East Indies, and the Philippines as well as China, raise and consume more than nine-tenths of the world's rice. These are lands of heavy summer rainfall. As raised in the Far East, rice requires a great deal of manual labor, and abundant labor is characteristic of the Far East.

The exportation of rice from China is forbidden by law, and much has to be imported. Since the rice field must be covered with standing water for several weeks, the field must be leveled and surrounded by an embankment which will retain the water. The ground is worked into soft mud by a crude plow or other implement, and the rice plants, previously started in nursery beds, are set out in rows by hand; during growth it must be hoed or cultivated. The most favorably situated lands may be flooded by the periodical overflow of the rivers or by canals, but other lands must be flooded or irrigated by artificial and usually very laborious methods. A limited quantity of dry-land rice is raised even at altitudes of several thousand feet, but the amount is unimportant. As a rule, the rice fields are small, often only a few yards square; the yield per acre is high—usually 30 to 40 bushels—or nearly double the average yield of wheat. At harvest the land is drained and the rice is cut with sickles, tied into bundles, carried on the backs of men and women to the threshing ground, and, as a rule, is threshed by hand and winnowed in the wind. The labor involved does not seem to matter; the aim is to get the largest possible amount of food, cost what it may in human labor, for labor is one of the cheapest things in the Far East.


WHAT CHINA SOLD IN 1926

WHAT CHINA BOUGHT IN 1926

FIG. 290.—Principal items of China's export and import trade.

Summarizing, it may be pointed out that the enormous production of rice in the monsoon lands is due to five main factors: (1) the subtropical and tropical climate, (2) the large amount of low-lying, alluvial land, (3) the heavy summer rainfall and consequent flooding of these lowlands, (4) the fact that rice is a crop that will yield a maximum amount of food if enough labor is bestowed upon it, and (5) the abundance of cheap labor in this part of the world.

Silk Production.—Silk is another product peculiar to lands of cheap labor, although it is not important in India. The mulberry upon which the domesticated silk worms feed grows in mild temperate as well as in tropical latitudes. It will grow as well in parts of the United States as in the Orient, and silk could be produced here if labor were sufficiently cheap. Formerly China had almost a monopoly of silk production, but Japan now leads because of greater care in the various operations and because of better business methods. A considerable quantity of wild silk is grown in north China and Manchuria where the worms eat oak leaves. The wild cocoons are gathered and sold and from them *pongee* silk is made.

The silk fabrics and embroidered robes made by the Chinese are marvels of patient labor and are of exquisite beauty, testifying to the artistic genius of these Orientals. Raw silk constitutes a large export of China, but the industry is losing ground relatively because of the superior methods employed in Japan (Fig. 290).

Tea Cultivation.—This is a third Oriental industry depending largely upon cheap and patient labor. This shrub, raised in China for thousands of years, grows a few feet high, thrives best on well-drained hill slopes in tropical and warm temperate latitudes. The leaves are picked by hand and cured by varying processes which give rise to the different varieties of tea; the early summer pickings yield the choicest leaves.

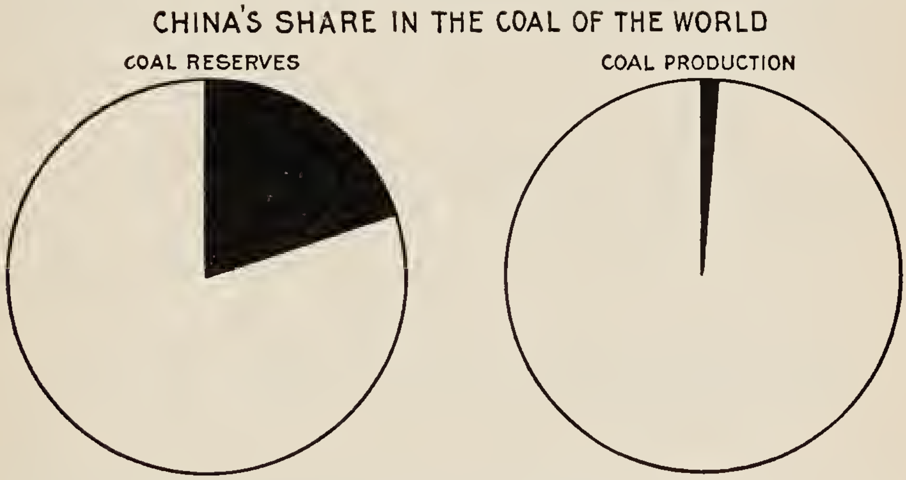


FIG. 291.—China's large coal reserves are being utilized to only a limited extent.

Up to about 1880, most of the export tea of the world came from China, where it was produced on a small scale in the gardens of thousands of small farmers. Great Britain and Russia were the chief markets. Gradually it was learned that tea grows luxuriantly on the rain-drenched tropical slopes of Assam and Ceylon, and large tea plantations handled by trained men now produce the greater part of the world's export tea. China still leads as a producer.

Mineral Wealth.—Next to the United States it is believed that China has more high-grade coal than any other country, and it is found in every one of the 18 provinces (Fig. 291). Owing to lack of transportation and to the limited use of coal by the Chinese, the production is relatively small (about 25 million tons a year). All but one of the large producing companies is foreign. China also has meagre but imperfectly known reserves of iron ore. Poor deposits in Manchuria are being worked by the Japanese and the important iron and steel works near Hankow are partly under Japanese control. Japan needs iron ore and will look to China, including Manchuria, for a large part of her needs. Herein lies one of several reasons for Japan's interest in China.

Tin in considerable quantities is mined in the South, and China is the chief source of tungsten. Nearly 75 per cent of the *antimony* used in the world comes from China. This is used in many alloys including type metal, babbitt metal, britannia metal, etc., and in time of war is used in great quantities in the manufacture of shrapnel.

Foreign Commerce.—The foreign trade of China has grown considerably, but it is much smaller than that of Canada which has less than 10 million people. The foreign trade of China shows the following characteristics:

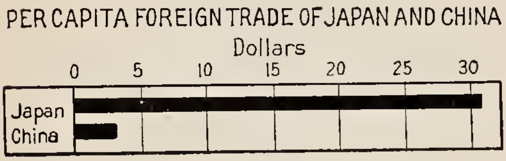


FIG. 292.

1. A fairly even balance between imports and exports.

2. A small volume of trade in proportion to the population; on an average each person buys but $2 worth of foreign goods a year and sells even less.

3. The predominance of a few items in the export trade—silk and soy bean products make up 33 per cent of the exports.

4. The strong hold of Japan upon Chinese trade, due largely to nearness.

5. The increase of the trade between China and the United States, the latter now holding second place and Great Britain third place.

The commercial nations look upon China as one of the great markets of the future; but China can become a large purchaser only by so improving her own methods of production that the labor of her people shall create a surplus to be exchanged for the products of other lands. In the long run, international commerce must be a fairly even exchange of commodities, although certain countries may give services in partial exchange for goods; as in the case of Great Britain which has already been mentioned. A very populous nation like China is not likely to export so much per capita as a country like Argentina which has a large agricultural area and a small population. Such countries produce a great deal more than they need, while China needs nearly all that it produces. Only by helping the Chinese to develop their resources, to use their labor to better advantage, and to raise their standard of life can the western nations expect greatly to increase the purchasing power of these millions of people. If China should buy from the United States as much per capita as Canada bought in 1928, the value would be nearly 50 times as much as we sell to the whole world.

Importance of Japan's Relations to China.—Japan has a great advantage over other nations with respect to Chinese affairs. This advantage of proximity and Japan's urgent needs make the action of Japan in China a matter of world-wide interest. Japan greatly needs the raw materials of China, especially iron, cotton, and foodstuffs, and almost equally she needs the great potential market of China in which to sell her manufactured goods. China is weak, disorganized, and greatly in need of outside capital to aid her development. Japan is in position to take advantage of China's needs and is so doing. She is gaining an increasing control over the mining industries and the foreign trade of China, and in the political councils of the Peking government Japan is believed to have been at times a well-nigh controlling influence. Nor is it strange that these things should be so; other strong nations have done the same with weak neighbors. But the other commercial nations are not willing that anything approaching the "closed door" in China should grow out of Japan's increasing hold upon Manchuria and other parts of China. The "open door" for the trade of all nations is demanded.

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CHAPTER XXXIII

JAPAN

The New Japan.—The rise of the Japanese from an isolated, unknown people to the rank of a first-class power in 70 years is one of the most remarkable instances of its kind in history. When Commodore Perry of the United States navy in 1854 persuaded the government of Japan to open its ports to foreign trade, the nation was in a state of feudalism somewhat resembling Europe in the Middle Ages, and the people were entirely ignorant of western civilization. Today Japan is a modernized nation, with a constitutional government, modern education, modern science, and a highly efficient army, navy, and merchant marine. To rise from obscurity to a place in the front rank of nations within the lifetime of an individual is nothing short of astounding. In this short time Japan has defeated China and Russia, has shared in defeating the central European powers in the World War, and has become the dominant power of the Far East.

The Empire and Its Dependencies.—Four main islands and several hundred small ones make up Japan as it was before the annexations began. Hokkaido, the northern island, is mountainous, forested, and cold in winter; it has little cultivated land and a relatively small population. More of the land is capable of cultivation and a greater population can be supported in the island, but the cold weather and the deep snow of winter keep settlers away. Honshiu, the main island, is two-thirds the size of California and lies in almost exactly the same latitude. While predominantly mountainous, the southern half is mild in temperature, is very densely populated, and all of the arable land is cultivated. The east coast is irregular, and sheltered bays and harbors are numerous. This island contains most of the large cities and industrial centers and it constitutes the heart of the empire. The two remaining larger islands are south of Honshiu, are separated from it by narrow straits, and are similar to it with the exception of having a slightly milder climate. One of these two islands contains the principal coal beds of Japan.

Formosa, a tropical island twice as large as New Jersey, was taken from China at the end of the war of 1895; it is still largely forest covered, is partly inhabited by uncivilized aborigines, and is making slow progress. It is known to commerce (1) as the world's principal source of camphor, obtained from a species of the laurel tree; and (2) for the excellent tea grown in the island.

Other Possessions.—North of Hokkaido is the island of Sakhalin, half of which is under Japanese control. On the mainland of Asia is the former kingdom of Korea, now called Chosen, which was annexed by Japan in 1910. The Koreans (about 20 millions) are a helpless, unprogressive agricultural people who resent Japanese rule. The possession of this territory on the mainland of Asia not only gives Japan opportunity for expansion, but it gives a foothold from which to extend Japanese influence into Manchuria and eastern Siberia. Japan also holds a highly strategic area including the cities of Dairen and Port Arthur in northeast China; it is a terminus of the South Manchuria Railway, a southward extension of the trans-Siberian Railway. It is evident that from a military and naval point of view, Japan dominates the whole eastern coast of Asia north of the Tropic of Cancer. With its possessions Japan now has 85 million people.

Japan's Problems.—Japan has advanced so rapidly and her population has grown so large that the nation is in a difficult situation. Within her own territories she cannot produce either the quantity of food needed by her people or all the raw materials necessary for her industries. To maintain the economic position already attained, to say nothing of satisfying her ambitions, Japan must have assured access to food supplies, iron, cotton, and certain other materials, and also assured markets in which to dispose of her products. Her debt is large; taxation is already very heavy—and her whole economic structure is in unstable equilibrium. America, with its great area and resources, its enormous home market, its wealth and abundant sources of revenue, can little appreciate the problems that confront Japan.

Japan's Points of Advantage *Location.*—The location of Japan determines its climate. The islands stretch across the same parallels of latitude as do the United States and Mexico; snow falls occasionally in Tokio, but stays only a few days. The northernmost islands are as cold as Maine; and Formosa, the most southerly, reaches into the tropics. Rainfall, partly brought by the summer monsoon, is ample; the cyclonic storms reach the northern islands and give the invigorating type of weather for which those storms are responsible. Surrounded by the sea, the islands' changes of weather are less rapid and less extreme than they are in most parts of the United States. The most unfavorable feature of the climate is the destructive *typhoon* which visits some of the islands on an average of 10 or 12 times a year, sweeping up from the south, frequently causing terrific floods and creating heavy loss of life and great destruction of property.

The military position of Japan is—like that of Great Britain—exceptionally favorable. The islands, which constitute the empire proper, can be reached only by sea, and have never in historic times been invaded by a foreign foe. Moreover, Japan's remoteness from most of the aggressive powers of the world is in itself a partial protection.

Commercially the postion is ideal for trade with the vast population of Asia, for half the people of the world are nearer to Japan than to any other industrial nation. China, India, and the East Indies are possibly among the greatest markets of the future.

Maritime Advantages.—Made up of many islands, equipped with numerous and excellent harbors, flanked by waters teeming with fish, Japan has had every inducement to send her people to sea, to develop in them a love for the sea, and to acquire skill in the building and sailing of ships—in short, to become what she is, a seafaring nation. Her fisheries are among the most productive in the world, employing over a million fishermen and yielding one of the important items in the diet of the people. The Japanese shipyards are thoroughly modern, and her navy and merchant fleet rank with those of the four or five leading powers. Japan is repeating the maritime history of Great Britain and for similar reasons.

Mineral Resources.—The Japanese islands are parts of a growing mountain system studded with volcanoes, fifty of which are active. Earthquakes are of daily occurrence, and (as in 1923) occasionally they are very destructive. Such a land supplies the conditions under which mineral deposits are found; and Japan is—considering its area—fairly well supplied with minerals. Gold, silver, zinc, lead and a number of minor minerals are mined in moderate quantities (Fig. 293). Copper is the leading metal, yielding as high as 40 million dollars a year, and supplying more than the present needs of the nation. The petroleum production is not large—a few million barrels a year—but even this amount is a decided advantage to the nation. Coal is reasonably abundant and of fair to good quality. Considering only veins 2 feet or more thick and not extending to a depth of over 2,000 feet, Japan has upwards of 800 million tons of coal available, and at greater depths probably four times as much more; but the depth adds to the cost of mining and makes Japanese coal expensive. Chinese coal is easier to mine and is near by, and Japanese have gained control of some of the best of these deposits with which to supplement native coal which cannot last far into the future. However, for the present and near future, the possession of coal is one of the chief advantages possessed by Japan.

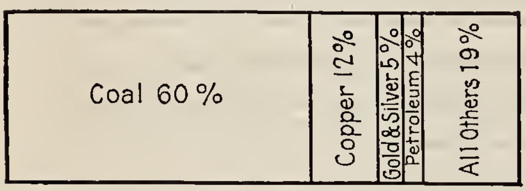


Fig. 293.—The value of the annual mineral output of Japan is about $200,000,000, distributed as above.

Unfortunately, the islands have practically no iron ore, but valuable deposits in Chosen, in Manchuria, and in China proper have been brought under Japanese control. A great industrial nation must have iron and this is one of the reasons for the activities of Japan in China. On the whole, the islands of Japan have sufficient mineral wealth to aid materially in making the nation an industrial state, but not sufficient to maintain such a condition very long.

The Japanese People.—Important as are the foregoing advantages, they would avail little if the Japanese people were not the energetic and able race that they are. Small of stature, but agile, industrious, adaptable, keen, imitative, and patriotic, they have a remarkable combination of qualities. They are devoted to their country, politic rather than sincere, tactful in diplomacy, courteous in manner, patient in waiting for a favorable opportunity, and quick to see and seize an advantage. Not essentially warlike, they are, nevertheless, militaristic, and their government and its spirit have had some resemblance to that of pre-war Germany.

Points of Disadvantage. *Small and Mountainous Country.*—Japan proper—not including its dependencies—is not so large as California and has less agricultural land. Mountains occupy 75 per cent of the area and 60 per cent is forest covered, but very little is suited to pasturage (Fig. 294). Japan proper has 60 million people, and parts of the larger islands have 600 to the square mile. None of the present dependencies can take care of any great number of the rapidly increasing population, and the

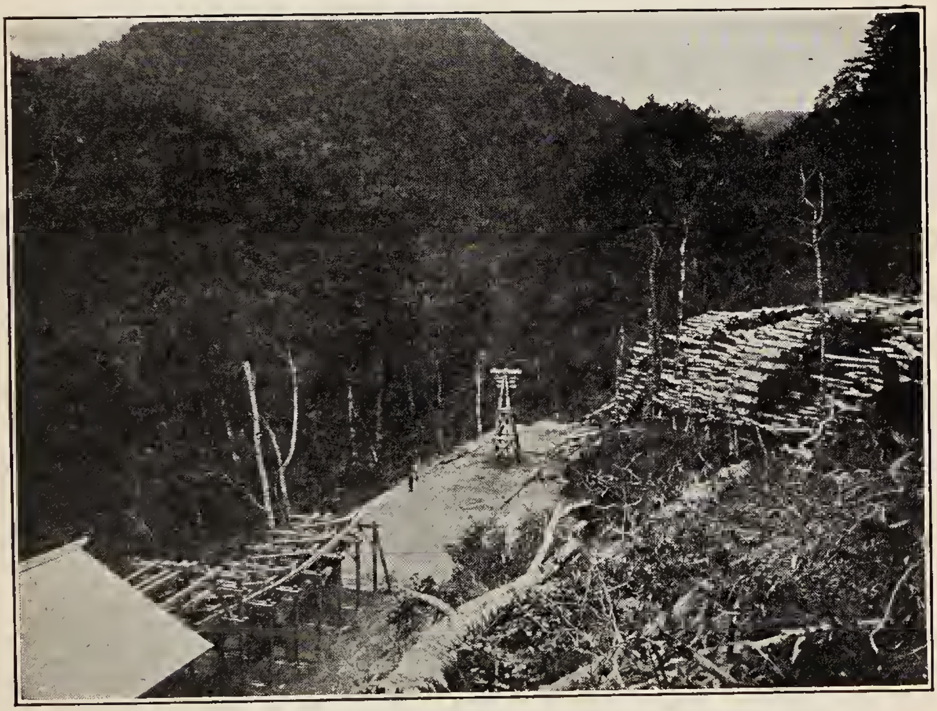


Fig. 294.—Lumbering operations in the mountains of Japan. (*Photo by U. S. Forest Service*).

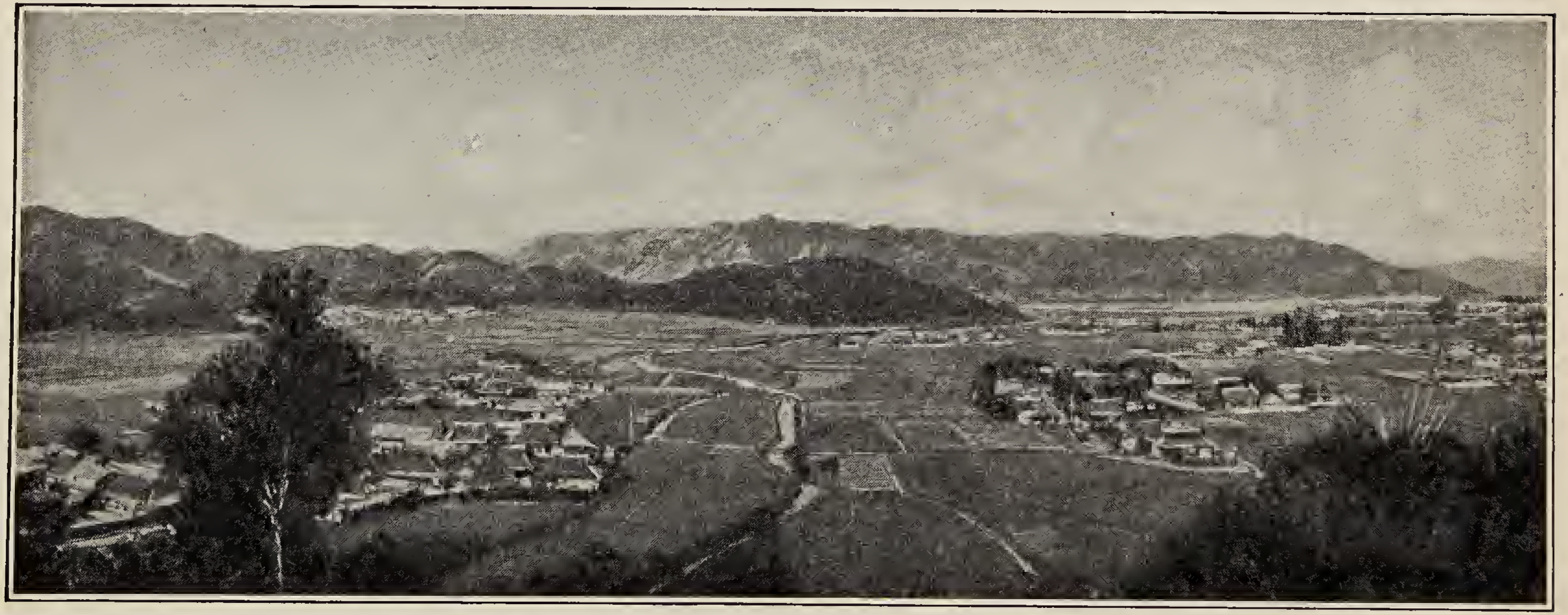
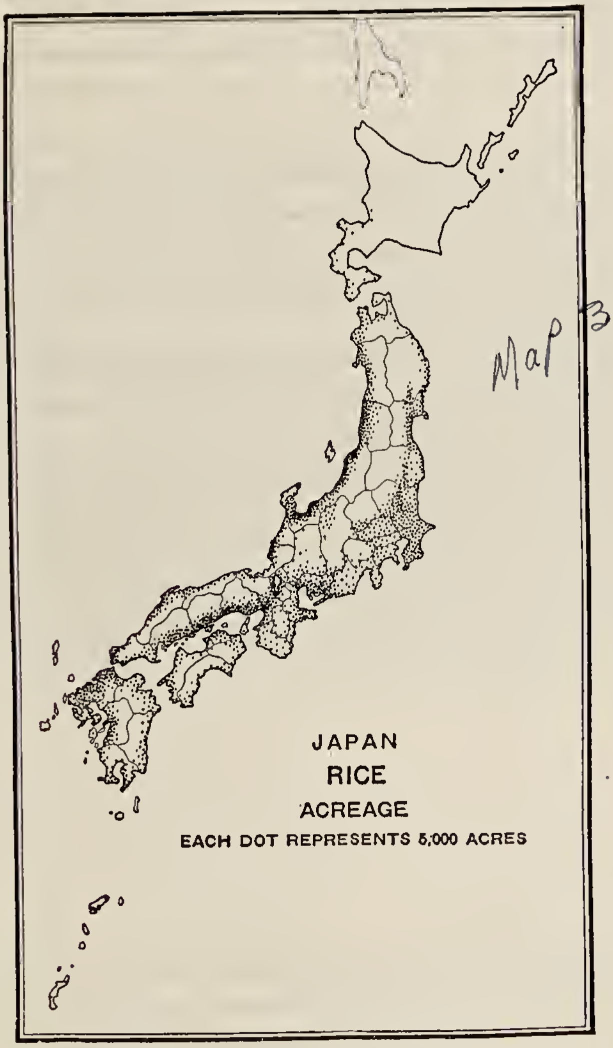


Fig. 295.—The densely-peopled and intensively-cultivated low lands of Japan are in sharp contrast with the larger areas of bare or forested mountains. (*U. S. Bur. Foreign and Domestic Commerce.*)

pressure of population is one of the great problems of Japan and a chief cause of her desire to get more land.

Poverty of the Land and People.—About 16 per cent of the land of Japan is under cultivation. This gives the 60 million Japanese only half as much agricultural land as the single state of Iowa has, and compels a low standard of living with the demand for food always outrunning the supply. (Japan aspires to become a manufacturing nation, but must rely upon outside sources for most of the raw materials.) With such an overpopulation and so few sources of natural wealth, it is but natural that the great majority of the people should be poor and the nation at large poor in comparison with the other great powers of the earth. However, the wealth of Japan was increased by the World War, while that of the leading European nations was diminished. Japan has attained a position of prominence quite out of proportion to her national wealth and resources.



Map 35

Fig. 296.—Over half of the cultivated land of Japan is devoted to rice. (*U. S. Dept. Agr.*)

The Importance of Agriculture.—Japan is still an agricultural nation and as many people are engaged in farming as in all other occupations combined. Only by the most intensive cultivation and generous fertilizing can the food supply be kept up. The little farms average only 2½ acres in size and many of them produce two, three, or even four crops a year. About half of the farm land is owned and worked by peasant proprietors. As in China, the lowland is practically all devoted to rice, and this single crop occupies over half the arable land (Fig. 295). High-grade farm land is valued at upwards of $500 an acre, and this in a country where prices are on a much lower plane than they are in the United States. Rice is, of course, the national food (Fig. 296), but over a third of the cropped area is upland, devoted to barley, wheat, potatoes, beans, and green vegetables. Little tea gardens on hill slopes are numerous, but tea is a minor item in Japanese exports. Land is too valuable to be used for livestock and a relatively small number of farm animals are raised. Meat and dairy products are luxuries to the Japanese working class.

A Land of Mulberry and Silk.—Three countries, Japan, China, and Italy, produce nearly all the world's raw silk and of these Japan is the leader (Fig. 297). Only where the climate is mild and where labor is cheap can this industry thrive. (A million acres in Japan are given to the mulberry, whose leaves are fed to the silkworms.) One Japanese family in every six raises silkworms; the work is nearly all done by women and girls, and requires a great deal of care for the silkworms are sensitive to changes of temperature and subject to destructive diseases. For some days after hatching from the eggs the worms eat voraciously and grow rapidly, but soon they seek a suitable place to attach the cocoons which they spin around themselves. The hair-like filament of silk in each cocoon contains about 300 yards. If left alone, the silkworm passes through a metamorphosis within the cocoon and later will pierce a hole in the wall and emerge as a moth. To prevent this, the cocoon is heated and the inmate is killed. Formerly the silk was reeled from the cocoon in the home, but now the cocoons are usually sold to buyers who take them to factories (called "filatures") where the silk is reeled into skeins by machinery, although much hand labor—mostly by women and girls—is still required. The silk cocoons represent over 18 per cent of the agricultural income of the country.

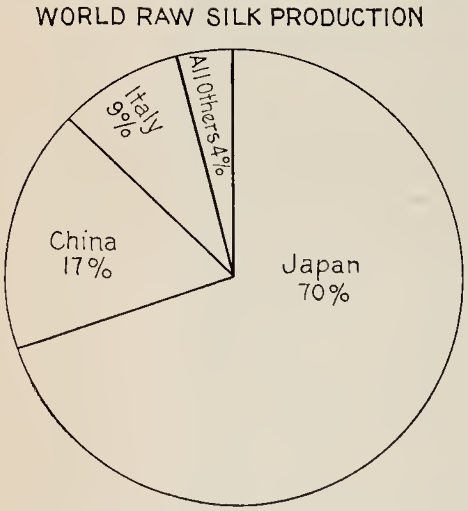


Fig. 297.—Inexpensive Oriental labor produces over eight-tenths of the world's raw silk.

Some of the raw silk is made into fabrics in Japan, but 80 per cent is exported, and nearly all of this comes across the Pacific to the west coast ports of the United States and Canada and overland to the silk mills of the Atlantic States. Silk is the only raw material that Japan exports in a large way; it is the "money crop" of thousands of families who depend upon the income from it. If the American market for this silk were cut off, a financial panic in Japan would ensue and widespread suffering would follow. Raw silk is Japan's greatest export and our purchases alone amount to over 300 million dollars annually, a fact that makes for peace between the two countries.

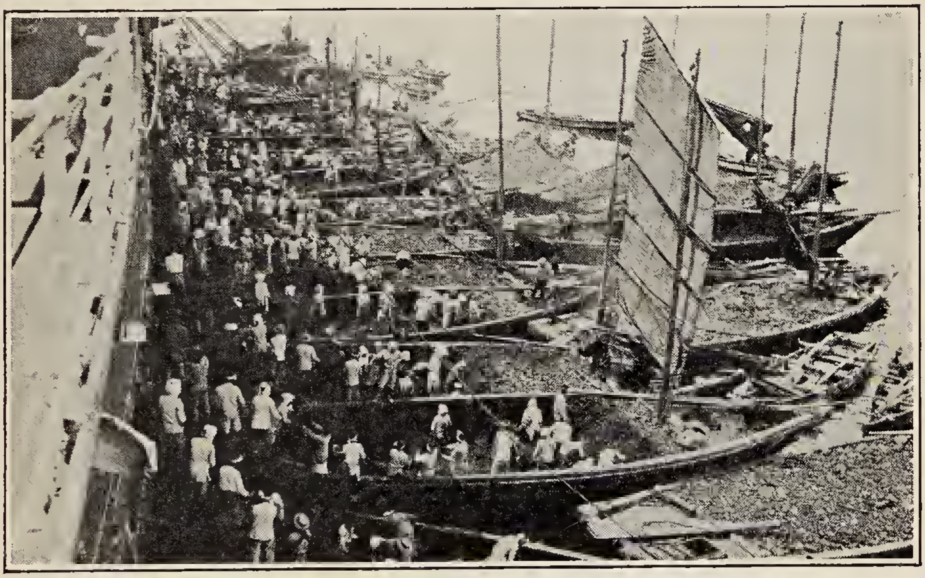


Fig. 298.—Coaling ship by human labor at Nagasaki, Japan. (*U. S. Dept. Agr.*)

The Rise of Industrial Japan.—Fifty years ago factory production of manufactured goods was a novelty in Japan. Hand-made products were the rule, and household industries are still common; but, in manufacturing, as in other things, Japan is increasingly adopting modern methods. With coal and waterpower for mechanical energy and an abundance of labor, Japan is making rapid progress in manufacturing. Years ago officials were sent to Europe and the United States to study their methods. Technial schools were established and the most promising graduates of these schools were sent abroad for further study. Model factories were established by the government and certain industries were subsidized. Railways and ship construction were promoted and banks established, and many other measures taken to promote industrial progress, and this progress was still further quickened by the victorious outcome of the wars against China and Russia. The textile and the iron and steel industries and shipbuilding received particular attention. In the eight years following the war against Russia (1905), the amount of capital invested in manufacturing more than quadrupled and the number of factory employees rose to a million, of whom more than half were women and girls. Upwards of 70 per cent of the value of all manufactures consists of silk and cotton.

Japan also specializes in certain articles, small in themselves, but aggregating a large total; for example, in an average year she exports

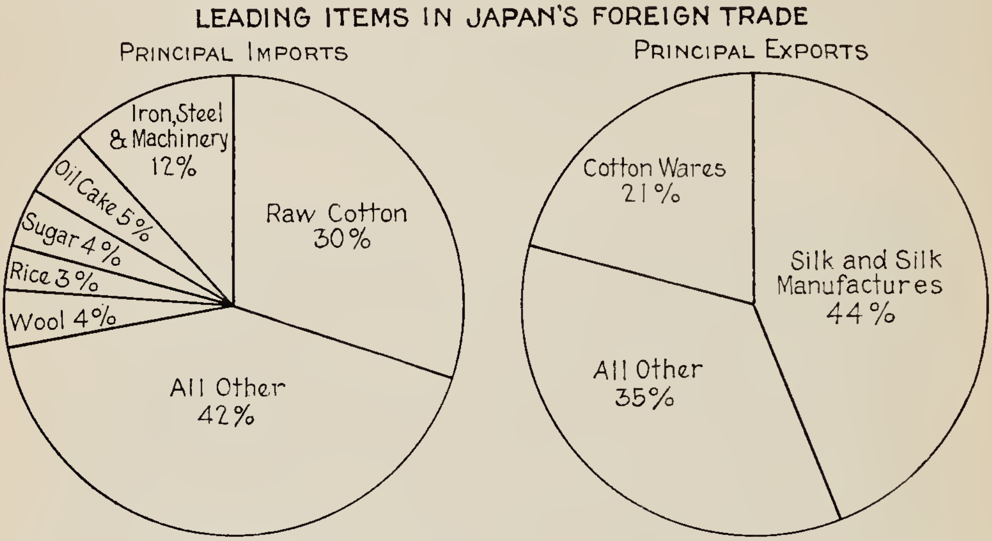


Fig. 299.—The leading items in Japan's foreign trade show industrial development.

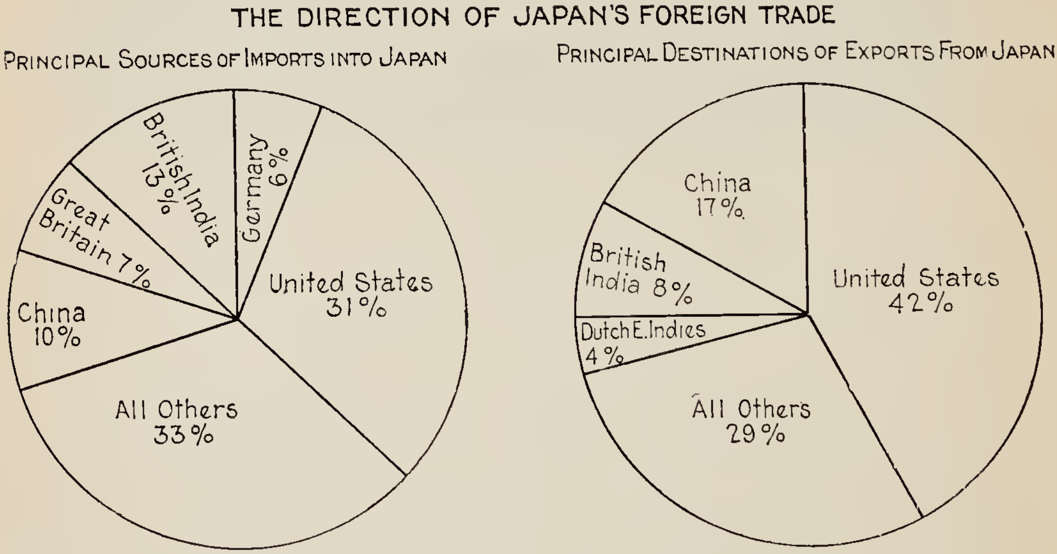


Fig. 300.—About 60 per cent of Japan's foreign trade is with the United States, China, and British India.

12 to 15 million dollars' worth of pottery, 6 million dollars' worth of buttons, 20 million dollars' worth of glass articles, and 5 million dollars' worth of toys.

Furthermore, all of Japan's industries were given a tremendous impetus by the high prices caused by the World War; this was especially true of the metal industries and shipbuilding. Wages are lower than in the United States or Great Britain and most goods that are made are produced more cheaply in Japan than in those countries; and, moreover, nearness to China, India, and other parts of the East gives Japan an advantage in selling manufactures in those markets.

Summary.—The phenomenal progress of Japan has been made possible by the character of her people and the advantages of her geographical position. The invigorating qualities of the climate, the ample warmth and rainfall for vegetation, and the coal resources for mechanical energy have all been on the favorable side. But the small area, mountainous surface, and lack of iron are handicaps. Under the stimulus of necessity and favored by the summer rainfall, agriculture has been made wonderfully productive, and with lowlands naturally flooded by heavy rains, rice has been made the food staple of the nation. The mild temperature and abundance of low-priced labor have made sericulture profitable and Japan leads the world in silk production.

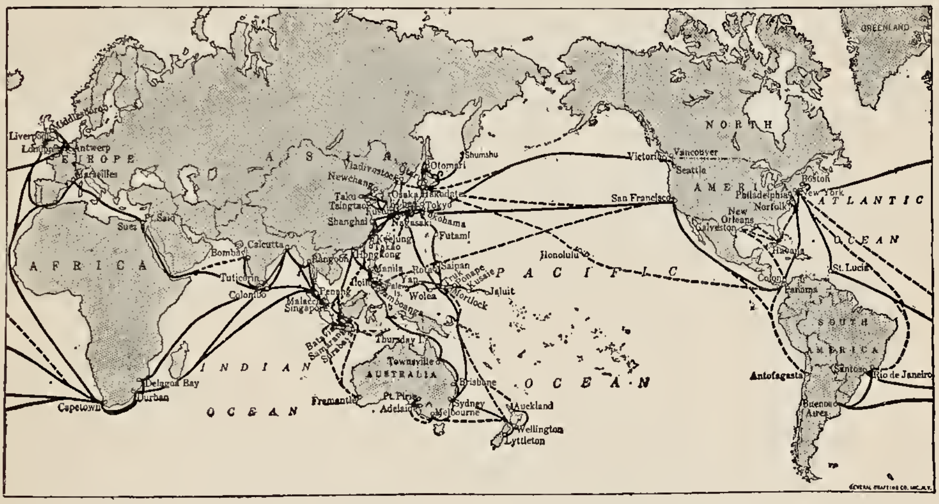

GREENLAND
NORTH AMERICA
ATLANTIC
OCEAN
SOUTH AMERICA
PACIFIC
OCEAN
INDIAN
OCEAN
AFRICA
ASIA
EUROPE
AUSTRALIA
Liverpool
London
Antwerp
Marseilles
Suez
Pt. Said
Bombay
Calcutta
Tuticorin
Colombo
Penang
Malacca
Singapore
Batavia
Manila
Iloilo
Hongkong
Keelung
Shanghai
Tsingtao
Taku
Newchang
Vladivostock
Otomari
Shumshu
Hakodate
Osaka
Kobe
Yokohama
Tokyo
Nagasaki
Futami
Saipan
Yap
Palau Is.
Woleai
Truk
Kusaie
Jaluit
Ponape
Honolulu
Thursday I.
Townsville
Brisbane
Sydney
Melbourne
Adelaide
Pt. Pirie
Fremantle
Auckland
Wellington
Lyttleton
Delagoa Bay
Durban
Capetown
Victoria
Vancouver
Seattle
San Francisco
Boston
New York
Philadelphia
Norfolk
New Orleans
Galveston
Havana
Colon
Panama
St. Lucia
Antofagasta
Santos
Rio de Janeiro
Buenos Aires

Fig. 301.—The expansion of Japanese steamship lines to nearly all parts of the earth has been remarkably rapid. The Japanese are becoming one of the leading carriers of the world's ocean commerce. Heavy lines indicate regular passenger and freight service: dash lines indicate occasional service. (*Nippon Yusen Kaisha*, 1922.)

In a country where human labor is abundant, cheap, and efficient, manufacturing is likely to grow up if wise leadership and official encouragement are provided, as they have been in Japan. Raw materials must be imported and markets must be found, and both are at hand in the nearby continent. Stretching for 3,000 miles parallel to the coast of Asia, the islands of Japan dominate that coast and give her important advantages over other nations in the commerce of the Far East. Overpopulation and an imperialistic government are leading to territorial ambitions in China and Manchuria, for Japan aims to be the Great Britain of the Far East, and like it, to become a great industrial and commercial nation. Rapid progress in this direction has already been made, and if eagerness does not overstep caution, Japan is likely to be increasingly the master power of eastern Asia.

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CHAPTER XXXIV

SOUTHERN ASIA AND THE EAST INDIES

Southwestern Asia

Unfavorable Climate and Topography.—A vast area, comprising southwestern Asia, is one of the least productive regions of the world. It includes (1) the Arabian Peninsula, (2) Mesopotamia, and (3) Persia and Afghanistan; it forms a part of the great tradewind desert of which the Sahara is also a part. Only in the highlands of northern Mesopotamia is there sufficient rainfall to give rise to rivers of any size, and 80 to 90 per cent of the region is too dry for crops without irrigation. Bagdad receives about 6.6 inches of rainfall yearly, all in the winter; but Mosul, near the headwaters of the Tigris, receives 17 inches. In this region, more than half as large as Europe, geographical conditions are so unfavorable that there is no important nation; scarcely enough food can be raised to feed the scanty population and the external commerce amounts to little.

The Arabian Peninsula is a plateau along whose seaward margins settled peoples live and engage in commerce, but the interior is almost unknown except to the desert nomads that roam over it. Mesopotamia, the ancient seat of great empires, has two rivers, the Tigris and Euphrates, in whose valley extensive irrigation works once existed. This region is now little better than a desert waste, the temperature of which rises to 120°F. in the shade. The region south of the Caucasus Mountains, including Armenia and the eastern portion of Turkey, has moderate rainfall, contains good-sized cities and an agricultural population. Persia is very mountainous, but contains 7 or 8 million people, a third of whom are nomads. So adverse are the climate and topography of southwestern Asia that it can be expected to supply to the world's commerce only a very few commodities.

Transportation.—A number of ancient and famous caravan routes cross southwest Asia, connecting the Mediterranean and Red seas with the Tigris-Euphrates Valley, the Persian Gulf, Central Asia, and even China and India. Damascus, Bagdad, and less well-known cities are focal points on these routes, and the greater part of the limited overland commerce of the region is still carried by caravan.

Two rather important railroads exist in the region; one the unfinished portion of the famous "Berlin to Bagdad" route. The British have extended the eastern part of this from Bagdad to Basra, not far from the

Persian Gulf. The other is the Mohammedan Pilgrim Line which extends southward from this railroad to Medina, 200 miles north of Mecca, the holy city of the Mohammedans. Persia has less than 200 miles of railway, and modern highways for wheeled vehicles are relatively few in that country or any other part of southwestern Asia.

Conflicts of National Interest.—Before the World War, the region including Turkey in Asia and Persia, was one of the most coveted of the weakly-held parts of the world. Germany, Great Britain, Russia, and France were all seeking with eagerness to get the strongest possible hold upon the territory and resources of this region, and the railroads that were built—with the possible exception of the Pilgrim Railroad to Medina—were intended to further the political and commercial aims of these countries. The region lies between Europe and the East, a region greatly desired by Russia in her pre-war expansion toward open ports in the south, and it also lay in the path of German territorial ambitions. Russia and Great Britain had divided Persia into spheres of influence, and all four countries were intriguing with Turks, Arabs, Persians, and others for the purpose of securing advantages in this competition. The war eliminated Germany and Russia for the time being, and now Great Britain and France are in competition, with Great Britain achieving the greater successes. The British have given support to two newly created Arab kingdoms, one (Hejaz) on the coast of the Red Sea, and the other (Iraq) in Mesopotamia; France has been given a mandate over Syria; Palestine has been given a degree of independence, but the political boundaries in this part of the world cannot be regarded as permanent.

Productions.—The region is necessarily a small producer of crops. The coast of Yemen on the Red Sea is believed to have been the region in which coffee was first cultivated, whence it was carried to other parts of the world; however, little coffee now comes from any part of Arabia. On the coastal lands enclosing the Persian Gulf is an extensive date-growing industry, and from this region the United States imports practically all the dates that it uses, 40 to 50 million pounds a year. The date gardens at the head of the Persian Gulf are of interest because of the unique method by which they are irrigated; the incoming tides check the outflow of the river (Shat el Arab), raise the water level, and flood the adjacent date gardens.

In many parts of southwestern Asia there is sufficient pasturage to support sheep and goats whose wool and hair enter largely into the rug, carpet, and textile industries for which this part of the world has a high reputation. The hand-made rugs of these Oriental lands surpass in elegance and durability any other rugs of the world, and the choicest of them sell for fabulous prices.

Petroleum.—One of the promising oil-producing areas of the world is in Mesopotamia and Persia. Already the output is large, and the

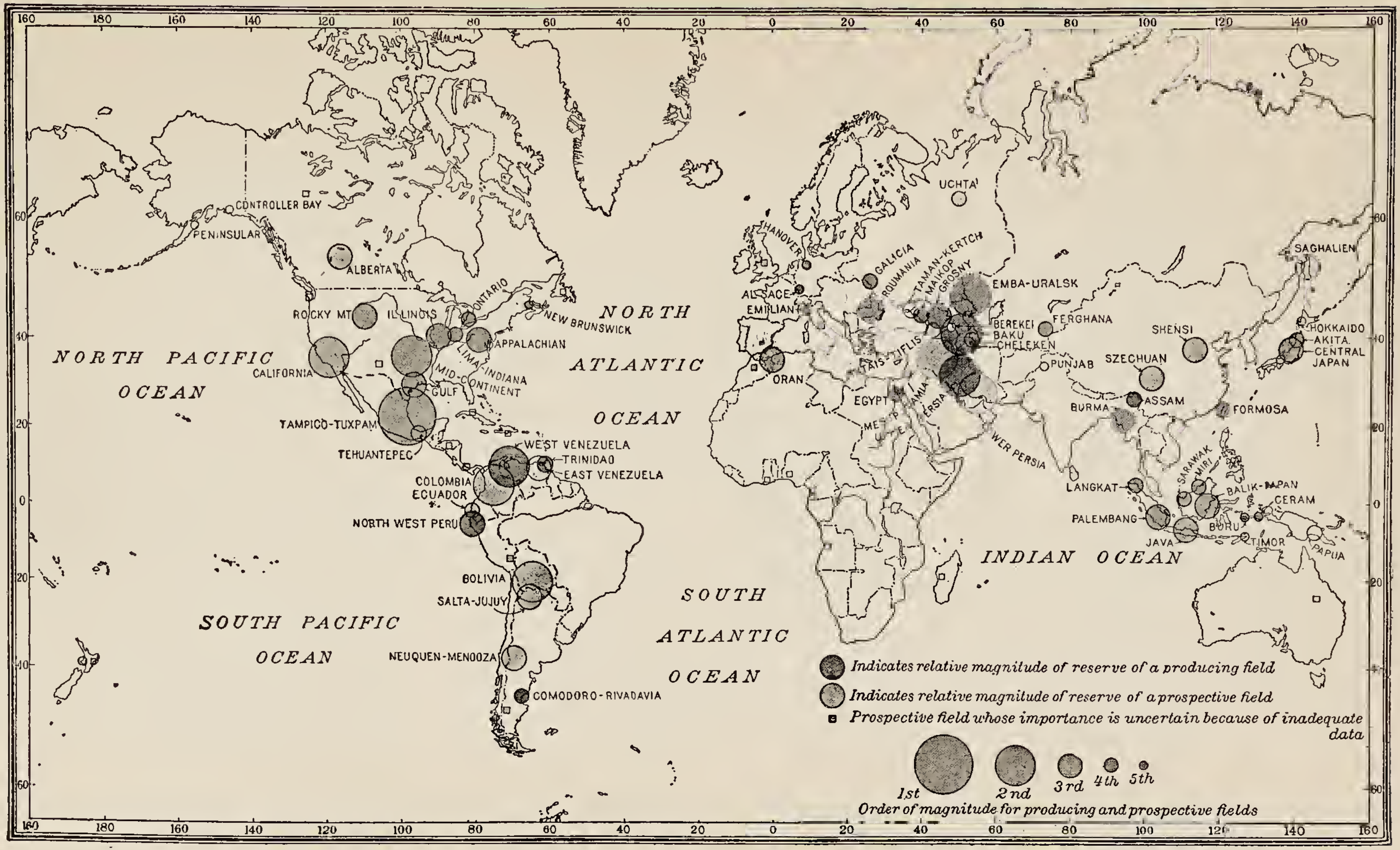

NORTH PACIFIC OCEAN
NORTH ATLANTIC OCEAN
SOUTH PACIFIC OCEAN
SOUTH ATLANTIC OCEAN
INDIAN OCEAN
CONTROLLER BAY
PENINSULAR
ALBERTA
ROCKY MT
ILLINOIS
ONTARIO
NEW BRUNSWICK
APPALACHIAN
LIMA
INDIANA
MID-CONTINENT
GULF
CALIFORNIA
TAMPICO-TUXPAM
TEHUANTEPEC
WEST VENEZUELA
TRINIDAD
EAST VENEZUELA
COLOMBIA
ECUADOR
NORTH WEST PERU
BOLIVIA
SALTA-JUJUY
NEUQUEN-MENDOZA
COMODORO-RIVADAVIA
HANOVER
ALSACE
EMILIAN
ORAN
GALICIA
ROUMANIA
TAMAN-KERTCH
MAIKOP
GROSNY
EMBA-URALSK
UCHTA
BEREKEI
BAKU
CHELEKEN
FERGHANA
TIFLIS
EGYPT
MESOPOTAMIA
PERSIA
LOWER PERSIA
PUNJAB
SZECHUAN
SHENSI
ASSAM
BURMA
FORMOSA
SAGHALIEN
HOKKAIDO
AKITA
CENTRAL JAPAN
LANGKAT
PALEMBANG
JAVA
SARAWAK
MIRI
BALIK-PAPAN
CERAM
BURU
TIMOR
PAPUA
Indicates relative magnitude of reserve of a producing field
Indicates relative magnitude of reserve of a prospective field
Prospective field whose importance is uncertain because of inadequate data
1st
2nd
3rd
4th
5th
Order of magnitude for producing and prospective fields
160
180
160
140
120
100
80
60
40
20
0
20
40
60
80
100
120
140
160
60
40
20
0
20
40
60

FIG. 302.—Distribution of the known and possible petroleum resources of the world. (*Map by U. S. Geol. Survey; published in National Geographical Magazine, Feb.,* 1920.)

struggle of various oil companies—mainly British, Dutch, French, and American—to secure holdings in this part of the world is intense, and has large international significance (Fig. 302).

BRITISH POSSESSIONS IN SOUTHERN ASIA

INDIA

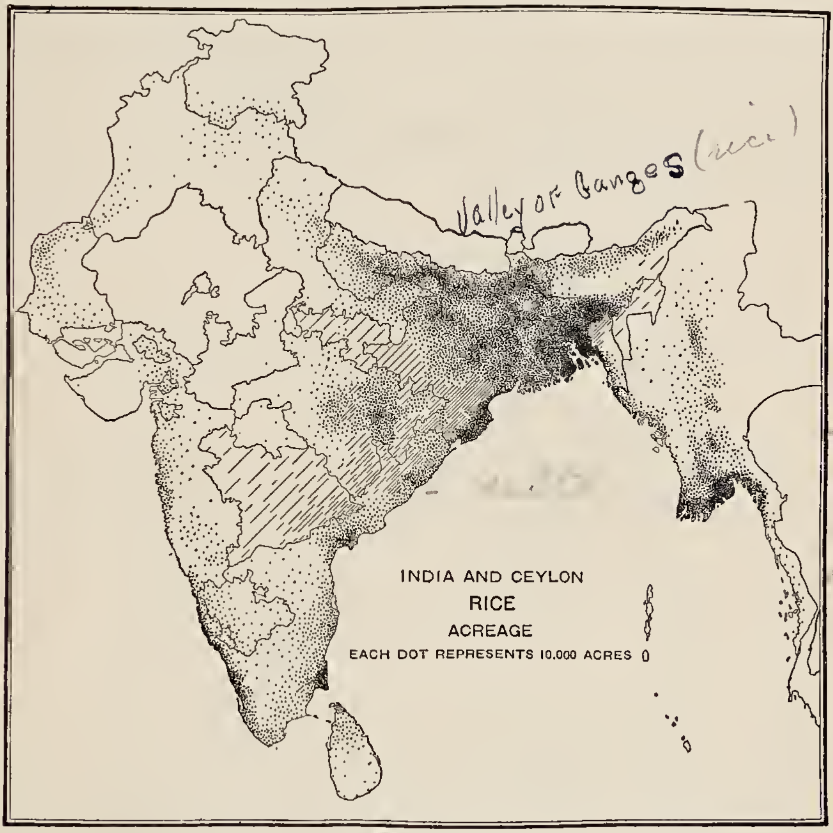
Geographical and Political Divisions.—Since the beginning of the seventeenth century the British have been gaining control of more and more territory in southern Asia which they have organized into the Empire of India and have incorporated into the British Empire. Many provinces or states make up India, some of them directly under British rule, and others (native states) under the rule of their native princes who are "advised" by a British resident advisor. Among these many states there is a great variety of languages, religions, and racial mixtures. India never has been in historic times united under the rule of its own people, for there is no unity of any sort among them.

India has three major physiographic regions: (1) the slopes and foothills of the Himalayas in the extreme north; (2) the broad alluvial valley south of the Himalayas drained by the Ganges and the Indus rivers, and (3) the Dekkan or peninsular part, composed of a plateau which is flanked on both coasts by mountains of moderate elevation known as the Eastern and the Western Ghats. The Ganges Valley and delta have a great depth of rich alluvium whose fertility permits an extremely dense agricultural population. The western portion of the plain is drained by the Indus, but a large part of it is desert or near-desert, except as it is changed by irrigation. Mountainous Baluchistan on the west, Kashmir on the north, and Assam and Burma on the east have also been added to the gradually expanding Empire of India which now has a total area nearly half as large as Europe and a population of over 300 millions.

The Importance of the Monsoon Climate.—Nowhere else is the monsoon type of climate so well developed and so important to such vast numbers of people as it is in India. The summer monsoon, blowing off the sea from June to October inclusive, brings heavy rains to most parts of India, though not to all; during occasional summers certain regions do not receive sufficient rainfall for crops, and disastrous famines have resulted. About three-fourths of the people of India live by agriculture, and most of them are wretchedly poor, so poor that a single crop failure or even partial failure brings millions face to face with starvation. The fact that the rains come in summer gives to India, with its tropical and subtropical temperatures, exceptional food-producing power, as similar conditions do in south China. The overpopulated condition is in part the outgrowth of climatic influences and the freedom from destructive wars.

The productivity of agriculture in India depends upon the strength of the summer monsoon, and the consequent amount of rainfall. (The winter (or northeast) monsoon, blowing from the continent, is dry, and during several months practically no rain falls in most of India. However, the winters are mild and crops will grow if irrigation water can be applied to the soil.) Two parts of India, included in the northwest and in the southeastern plains, receive rainfall in winter.

The Principal Crops.—In only one country of the world (China) is a larger population dependent upon the single industry of agriculture.



Rice concentra
in the
lowland
of the
Ganges
Brahmapu
valley
and
delta

Fig. 303.—The low, wet, coastal lands and delta regions of India grow rice. (*U. S. Dept. Agr.*)

In India more people gain their living by cultivating the soil than in all North America, South America, and Australia combined. It is a country of small farmers who till small pieces of land situated around some 600,000 agricultural villages. Their methods are crude and laborious in the extreme, but the people, most of whom are entirely illiterate, are too conservative to adopt modern methods and too poor to afford modern implements. (On an average three people must derive their living from every two acres of land.) The average American farmer's family of five or six people has the proceeds of 130 acres of land. The great agricultural production of India is made possible by (1) the large area of arable land, (2) the rainfall of the summer monsoon, (3) the warm winters which permit two crops a year on some of the land, (4) the dense agricultural population and intensive cultivation, and (5) the extensive use of irrigation.

Rice.—About one-third of the cultivated land of India (70 to 80 million acres) is devoted to one crop, rice, which is the most generally used food of the country. Most of the rice is of the wet-land variety, and its production is especially concentrated in the lowlands of the Ganges-Brahmaputra Valley and delta, although the coast lands of the Dekkan and of Burma also grow rice as a major crop (Fig. 303). Notwithstanding the enormous consumption of rice in India, there is usually a surplus for export.

Wheat, grown most largely in the drier lands of the Indus and the upper Ganges Plain (and partly under irrigation), occupies an acreage second to that of rice, but only one-third as great (Fig. 304). India is one of the important wheat exporting countries, sending a large part of the exports to Great Britain.

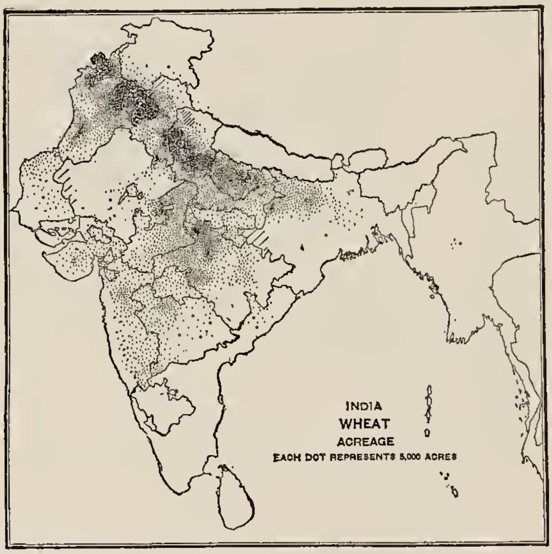


Fig. 304.—The dry lands of northwestern India produce most of the wheat as a cool-season crop and, in part, with the help of irrigation. (*U. S. Dept. Agr.*)

Cotton occupies an acreage nearly equal to that of wheat, and this gives India second place in the world as a producer of cotton. It is grown mainly in residual soils of the Dekkan and mostly in the region tributary to Bombay, in whose cotton mills much of the crop is used (Fig. 305). A minor portion of the crop is exported; Japan, for example, draws a part of her supply of raw cotton from India.

Cane sugar is another of the characteristic crops of India whose output is second only to that of Cuba. Most of the sugar, however, is used within the country. It is mainly grown in small plats under irrigation in the fertile lands of the Ganges Valley.

Jute.—The world's demand for jute for bagging and for burlap calls annually for millions of bales and almost every bale of it is grown in India, mainly on the low, wet lands of the Ganges-Brahmaputra delta; (it is the one crop of which India has a monopoly) Most of it is exported

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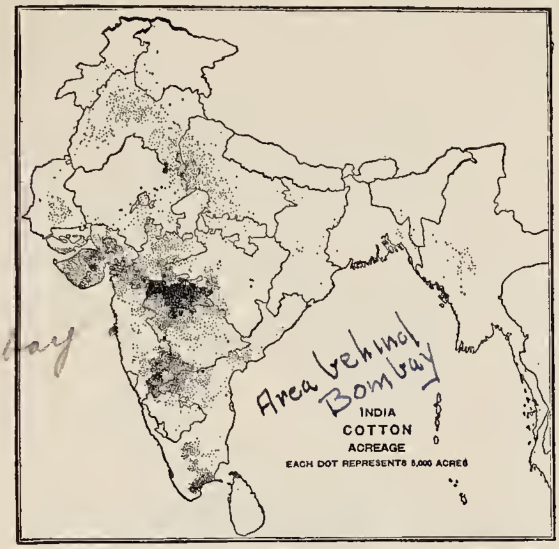
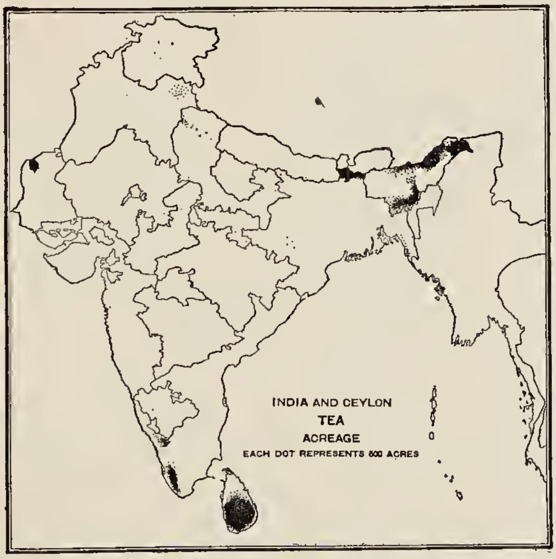

INDIA
COTTON
ACREAGE
EACH DOT REPRESENTS 5,000 ACRES

Bombay

Area behind Bombay

Fig. 305.—India ranks third among the countries in the production of cotton. (*U. S. Dept. Agr.*)

in the manufactured form of burlap and gunny sacks. The United States, for example, uses hundreds of millions of yards of this cloth yearly for bags and for wrappings of cotton bales.


INDIA AND CEYLON
TEA
ACREAGE
EACH DOT REPRESENTS 500 ACRES

Tea

[illegible]

Fig. 306.—The principal tea-growing districts of India and Ceylon. (*U. S. Dept. Agr.*)

Oil-yielding seeds, including castor beans, flax, rape, mustard, and sesame occupy millions of acres, and they and their oil constitute one of the larger exports of India.

Tea.—Tea, grown mainly on the moist but well-drained hill slopes of Ceylon and in northeastern India, is raised under British management, employing cheap native labor; over 800,000 persons are engaged in this industry. India supplies more export tea than any other country and the greater part of it goes to the British Isles and the British colonies (Figs. 306, 307).

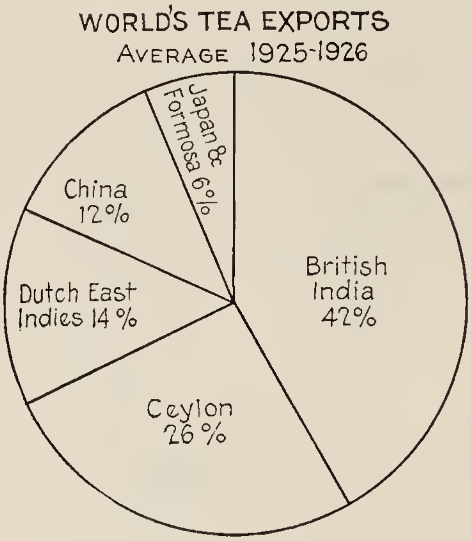


Fig. 307.

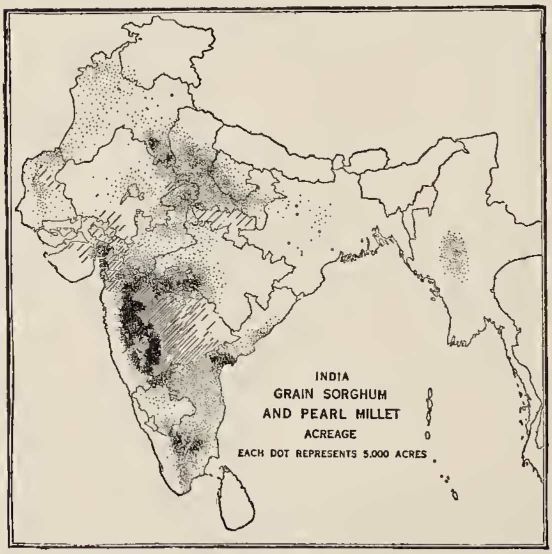


Fig. 308.—Sorghum and millet are important food grains in drier sections of southern India. Compare with wheat and rice. (*U. S. Dept. Agr.*)

Grain Sorghum and Millet.—In the drier parts of the Dekkan experience has shown that the grain sorghums and millets are especially well adapted to the soil and climate, and those crops contribute one of the leading cereals in the food supply of India, but they do not enter into the export trade to any extent (Fig. 308).

The High Development of Irrigation.—India is the foremost country of the world in its extent of irrigated lands. The British engineers have greatly increased the irrigated area of this ancient land where the practice was in use thousands of years ago. Fifty million acres in India are now irrigated as compared with 23 millions in the United States. Various methods—including the storage of water in cisterns, "tanks," and ponds, as well as in government-built reservoirs—are employed, and by the extensive works in the valleys of the Ganges and Indus, the food-producing power of the country is materially increased. This is another of the benefits that British rule has brought to India.

Livestock.—Unlike China and Japan, India has great numbers of domestic animals, mainly cattle and goats (Fig. 309). It has twice as many cattle as the United States, three or four times as many as Argentina, and about one-fourth of all in the world. Yet the Hindus make little use of their animals for meat and only to a moderate extent for milk; they are mainly used as draft animals. The principal Hindu religion opposes the killing of animals, and devout Hindus will starve rather than kill an animal for its meat. The Indian buffalo, or water buffalo, used in great numbers in the rice-growing regions, is peculiarly suited to working in the wet lands of the rice fields. The animal is also kept for its milk.

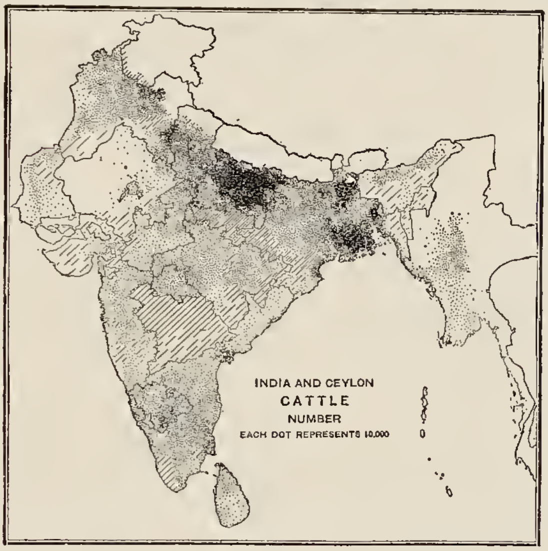


Fig. 309.—India has twice as many cattle as the United States on little more than half as much area. (*U. S. Dept. Agr.*)

Nearly one-fourth of the goats of the world are raised in India, which country is consequently one of the chief sources of goat skins. Sheep are not particularly numerous and swine are little known.

Mineral Resources.—If India possesses large mineral wealth, the fact has not been established. This may be due to the lack of capital and technical mining skill among the Hindus, and possibly also to British

See P. 469. N.B. of Monsoon climate

willingness that the Hindus shall not develop their mineral resources. Coal is the chief mineral product, yet the quantity mined annually is less than it is in Japan. The consumption of coal in India is relatively small for two reasons: (1) little is used for domestic purposes in such a warm climate, and (2) manufacturing has not progressed far enough to require a great quantity. The petroleum production of Burma is of importance in this part of the world where petroleum is relatively scarce. Gold has long been mined in India in small quantities and is the basis of a goldsmith's industry for which Hindu artisans have achieved a high reputation. India is also a leading source of manganese.

Manufactures.—In the past, but to a diminishing extent in the present, India has been a country of hand manufacturing. Labor is about the most abundant thing in India, and the people have been slow to adopt the use of machinery in manufacturing, fearing it would deprive them of work. However, modern factories are increasing; (there are over 300 cotton mills employing an average of 1,000 persons each, and using mainly home grown cotton) There are from 55 to 65 jute mills employing an average of 3,500 persons each. These are the two leading lines of manufacturing, and they employ nearly one-half of all the factory workers in the country. There are, for example, only two really large iron and steel plants in India. (It might be assumed that the British government would not enter actively into the promotion of manufacturing industries in this colony, which is the largest purchaser of British goods, yet that is not actually the case. "Moreover, it is a tropical and subtropical country and no such country seems fitted to achieve industrial development. Yet India has made notable progress, and has imported as high as 100 million dollars' worth of American machinery in a single year.

Note

Cott and jut mf

Indi larg purch of B go

Transportation.—Only two Asiatic countries are well equipped with railroads; they are Japan and India, and the latter country owes its railroads to British initiative. (The Ganges Valley with its dense population and great agricultural production is a network of railways.) The Ganges itself, once the main commercial artery of the valley, no longer has its old-time importance as a waterway, though it continues to be the sacred river. The Dekkan is traversed by a considerable number of railway lines which focus upon the important ports of Bombay and Madras. (The railways of the Ganges Valley find their eastern outlet at Calcutta, the chief port of the country.) India is about the only part of the continent of Asia that has modern hard-surfaced roads, and it has upwards of 50,000 miles of these, also largely the result of British rule.

Foreign Commerce.—There are at least seven outstanding facts about the commerce of India:

1. The total value of exports and imports reaches nearly 2 billion dollars a year, yet this is less than $7 per capita of the population, a very small figure.

ports - agricultur
imports - mfg. goods

2. Five products—all of them agricultural—make up the greater part of the exports; (*a*) jute and its products, (*b*) cotton and its products, (*c*) tea, (*d*) hides and skins, and (*e*) rice.

3. About 75 per cent of the imports consist of manufactured goods, an evidence of the backward industrial condition of the country.

4. About 50 per cent of the exports consist of textile materials and textile manufactures, mainly cotton and jute.

5. Nearly 50 per cent of the imports come from the United Kingdom and 50 per cent from the rest of the world, an evidence of Britain's control of India's import trade.

6. The United Kingdom sells nearly twice as much in value to India as it buys from India, another reason why the United Kingdom desires to retain India.

7. Gunny cloth and other jute products constitute about half of the value of India's exports to the United States, an indication of the dependence of the United States (and the world) upon India for these important products.

CEYLON

The productive and populous island of Ceylon, at the southern tip of India, has nearly as many people as the continent of Australia. It is governed separately from India, but is a British dependency. It is mountainous and only 20 per cent is under cultivation, but it produces large quantities of three products: rubber (from plantations), tea, and coconut products. It is also the chief source of the best grade of graphite, and one of the two leading producers of this mineral. The value of the foreign trade of this island is 10 times as great per capita as that of India, due largely to the high development of plantations under British management. Colombo, the chief port of Ceylon, is one of the important ports of call on the Suez Route from Europe to the Far East.

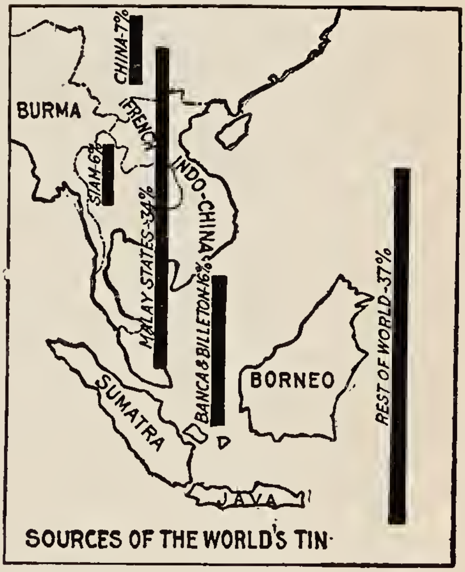


FIG. 310.—About 63 per cent of the world's tin comes from southeastern Asia and nearby islands.

THE BRITISH MALAY STATES

At the southern end of the Malay Peninsula is a group of dependencies belonging to Great Britain. This region is important for three reasons: (1) it includes the port of Singapore, one of the chief collecting and distributing centers of the Orient; (2) it forms a part of the leading tin producing region of the world (Fig. 310); (3) it is the foremost rubber-producing district of the world. Through the control of this small area Great Britain holds a very considerable degree of control over two of the great products of commerce—rubber and tin.

Rubber Plantations.—The rapid rise of rubber plantations, and the displacement of wild rubber by cultivated rubber in the world's markets has already been referred to. Since the automobile came into extensive use (29 million in 1929) the demand for rubber has increased phenomenally and most of the supply is now obtained from plantations in the Malay Peninsula, Burma, Ceylon, and certain islands of the East Indies (Fig. 311); it is reported that from 60 to 70 per cent of the acreage planted to rubber is controlled by British capital. The Malay Peninsula is the largest producer. As recently as 1905 the quantity of plantation rubber which was marketed did not exceed 150 tons, and in 1910 plantations supplied only 10 or 12 per cent of the world's rubber; now they supply about 95 per cent.

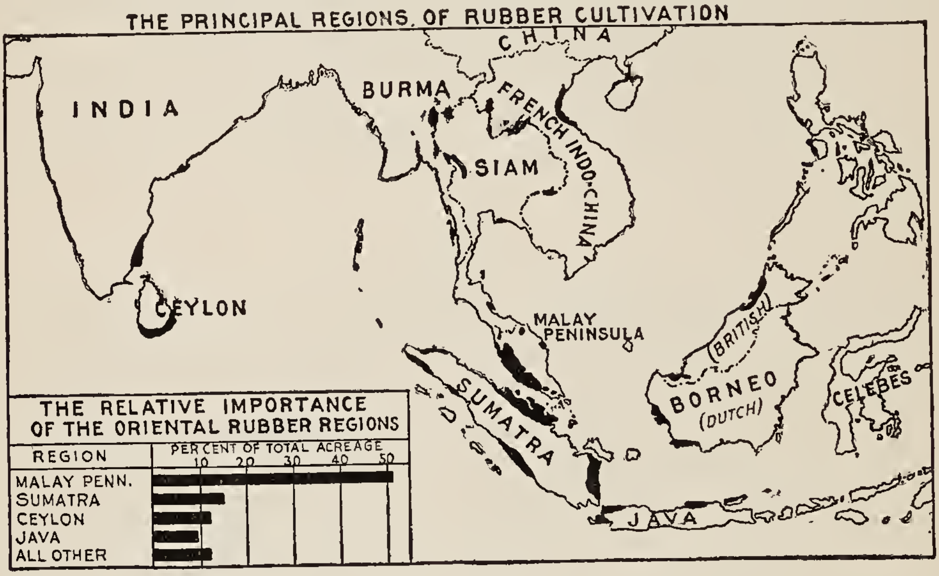

THE PRINCIPAL REGIONS OF RUBBER CULTIVATION
CHINA
INDIA
BURMA
FRENCH INDO-CHINA
SIAM
CEYLON
MALAY PENINSULA
SUMATRA
(BRITISH)
BORNEO
(DUTCH)
CELEBES
JAVA
THE RELATIVE IMPORTANCE OF THE ORIENTAL RUBBER REGIONS
REGION
PER CENT OF TOTAL ACREAGE
10
20
30
40
50
MALAY PENN.
SUMATRA
CEYLON
JAVA
ALL OTHER

Fig. 311.—Rubber-producing regions of southeastern Asia and the East Indies.

The species of rubber tree most generally grown is one which originally came from Brazil and was introduced into the East by the English. Rubber trees grow only within the tropics, and most of the plantations are not far from the equator. The hot climate and heavy rainfall required by these trees are found in the American or African tropical lands as well as in the Orient, and so far as the healthy growth of trees is concerned the plantations might very well prosper in those regions; but the care of the plantations and the production of a high grade of rubber requires abundance of labor and fairly intelligent labor, and this condition cannot be met in tropical America or Africa, but can be met in the Orient where Chinese, Malays, and other workers are numerous and anxious to work. Plantation rubber is the product of (1) rainy tropical climate, (2) European capital and brains, and (3) Oriental labor. The initiative, energy, and money come from the temperate zone, and the market is almost wholly there. It is another illustration of the fact that the development of the tropics must be directed by people from cooler lands.

After clearing the jungle and preparing the land, small rubber trees are planted from 12 to 20 feet apart in rows—100 or more trees to the acre. Within about 6 years the tree grows to a diameter of 6 inches and is ready for tapping, which consists in cutting through the outer bark whence a milky fluid (latex) flows slowly for several hours and is caught in little cups attached to the tree. A new cut is made and the latex gathered each day, about three-quarters of a teacupful from an average tree. About 35 per cent of the latex is rubber and most of the balance is water. Methods have so improved that the best plantation rubber is now nearly as good as the choice wild rubber from the Amazon Valley, and can be produced more cheaply. Very large profits have been made from the successful plantations, and this led to overproduction and a decline in price below the cost of production. Later an effort was made to force a higher price but it failed.

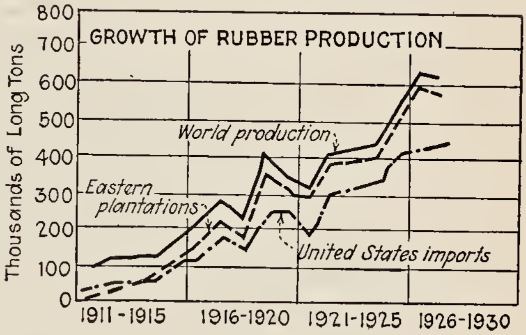


Fig. 312.

The Consumption of Rubber.—The 29 million or more auto-vehicles in the world require over 100 million tires a year; 80 per cent of these are made in the United States, and over half of them in the single city of Akron, Ohio. The United States uses about twice as much rubber as the rest of the world uses. Some of this is bought through London but still more is bought directly by American buyers at the great rubber auctions of Singapore, the world's chief primary rubber market. The United Kingdom, Germany, and France are the other nations that use rubber in large quantities (Fig. 312).

HONGKONG

The British Crown Colony of Hongkong includes the island of Hongkong and a small area on the mainland of south China not far from the city of Canton. The city of Victoria, a free port, on the island, has become one of the principal commercial cities of the Far East. It is a center at which the products of the East are assembled and shipped to almost every part of the world. It is also a distributing center which receives goods from all parts of the world and reships them to the various parts of the Far East. In an average year this port handles three-quarters of a billion dollars' worth of commercial products. It is also a naval base of the British fleet.

The East Indian Region

Farther India.—The peninsula which projects from the southeastern corner of Asia is often referred to as Farther India and also as Indo-China. The British possessions in this peninsula have already been referred to. Farther India also includes the independent kingdom of Siam and the colony and protectorates included in French Indo-China. The region consists of forest-covered mountains and lowland jungles and a small proportion of cultivated land. The forests include the teak tree, one of the most valuable of woods; it is very strong, hard, and resistant to decay, and is in demand for shipbuilding and for other purposes requiring wood of exceptional endurance. On the cultivated lands, rice is the all-important crop, and the export of greatest value. Siam is a backward country as large as Germany but has only 9 million people. French Indo-China is much larger than France and has a population of 20 millions, but the tropical conditions and general indolence of the people have prevented any noteworthy economic development.

THE DUTCH EAST INDIES

Description.—The Dutch East Indies consist of a large and important group of tropical islands lying southeast of the continent of Asia. Java, Sumatra, Celebes, large parts of Borneo and New Guinea, the Molucca Islands and many others make up the group (Fig. 311). Java, the most highly developed island, is as large as New York State and has 35 million people, or 3 or 4 times the population of Canada. Sumatra, still larger, is undergoing development, but Borneo, Celebes, and New Guinea are still only partly explored and are inhabited in the main by semi-savages. All of the islands lie close to the equator, receive heavy rainfall, and are capable of producing enormous quantities of sugar, rice, rubber, tea, copra, coffee, and other tropical products as the world shall need them. This part of the world is occupied by people of the yellow and brown races who multiply as fast as the food supply permits and who make a fair type of laborers as tropical labor goes.

Products of Trees and Shrubs.—The coconut is one of the valuable trees of the tropics, and grows in countless abundance on the islands and shores of tropical seas. The tree grows wild or in plantations, beginning to bear at about 7 years of age and continuing for 75 to 100 years, each tree yielding 30 to 40 nuts a year. The world is said to use from 8 to 10 billions of them annually, making the coconut one of the world's most important food fruits. The meat of the coconut is widely used for food among the natives of the tropics, but great quantities of the dried meat (copra) and of the oil pressed from it also enter commerce and are used in Europe and America, both in edible form and in the making of soap. The Philippine Islands—sometimes included in the East Indies—are the largest producers of coconuts, but all this part of the world raises them.

Spices were long a leading commercial product of the East, and the spice trade was one of the main reasons for seeking a new route to India, which effort led to the discovery of America. The Molucca Islands are a main source of nutmegs, cloves, and mace; Ceylon, of cinnamon; and various islands and shore lands yield pepper, but the total value of these products is no longer very large in the world's commerce.

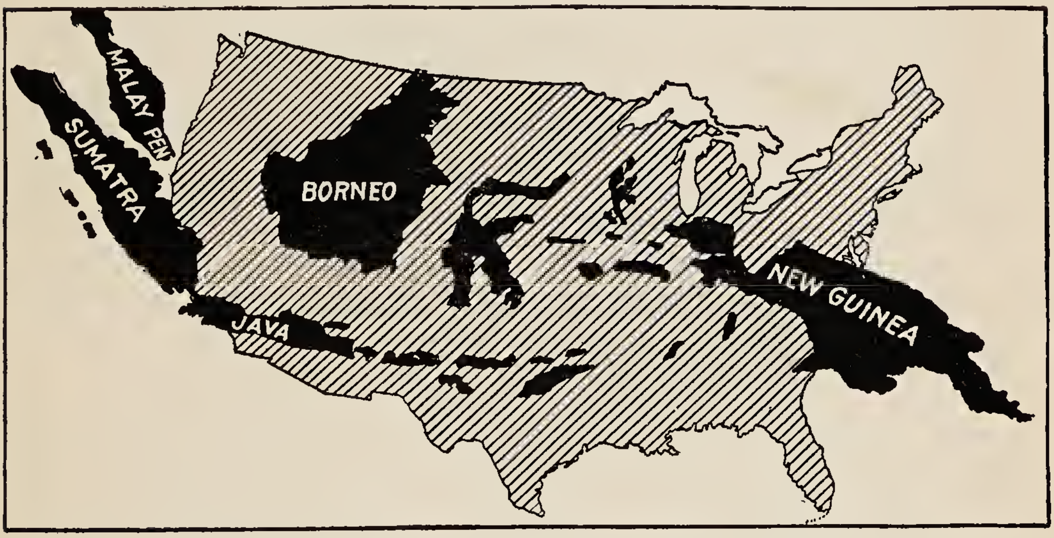


Fig. 313.—The East Indies and the United States compared in area. The East Indies have an east-west extent of between 4000 and 5000 miles.

Tea and coffee both grow in Java and at times both have been leading exports; coffee is no longer important, but tea is exported from the islands to the extent of more than 100 million pounds annually.

Cinchona or Peruvian bark supplies the material from which *quinine*, one of the most important of drugs, is obtained. Formerly this shrub was known only in Peru, but like the rubber tree, it was taken to the Orient, and now Java is almost the sole producer of cinchona on a commercial scale.

Rubber plantations are numerous and successful in Java and Sumatra and are a part of the great rubber-producing region of the East (Fig. 311).

Sugar, Rice, and Tobacco.—Java is one of the three leading producers of cane sugar (Cuba, India, Java). The great markets for sugar are Europe and the United States, but they are many thousands of miles from Java, whose sugar is thus at a disadvantage in competing with Cuban sugar in the United States and with beet sugar in Europe. Nevertheless, sugar ranks second to rubber among the exports. Tobacco is also a large export. In Java, as elsewhere in the East, rice is the chief food of the people and occupies five-sevenths of all the land which the natives cultivate, yet not enough is grown for the great population and quantities have to be imported.

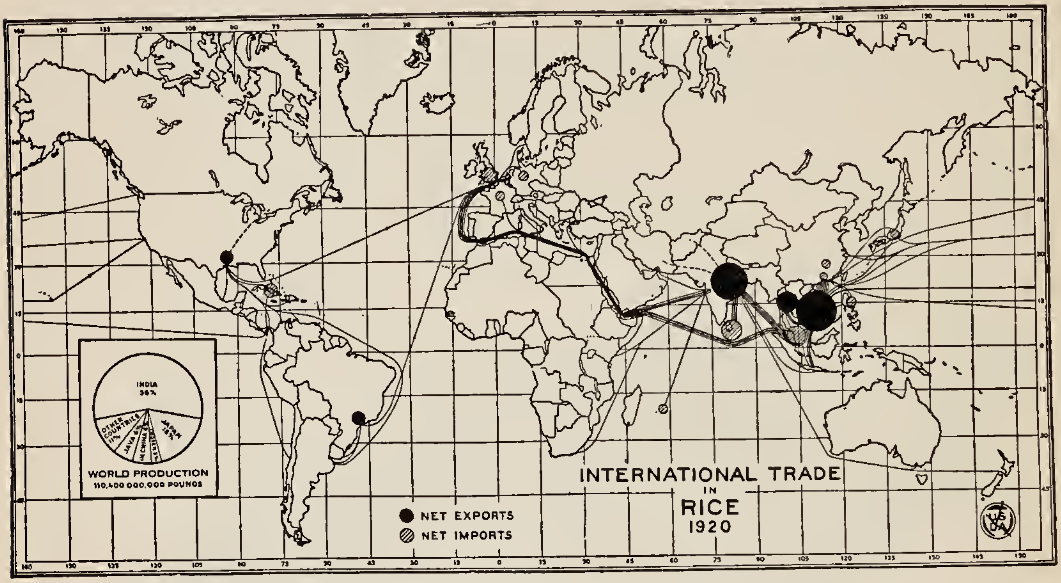


FIG. 314.—Most of the world's rice is grown and used in the monsoon lands of the Orient, the most densely populated section of the world. (*U. S. Dept. Agr.*)

Mineral Products.—Two Dutch Islands, Banka and Billiton, situated near the Malay Peninsula are, like the Malay states, large producers of tin (Fig. 310). Petroleum in considerable quantities is being produced in several islands of the East Indies and this region promises to be a significant source of oil in the future. Coal in moderate quantities is mined in Java, but on the whole, the East Indies are and will continue to be primarily producers of agricultural rather than mineral products.

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CHAPTER XXXV

AFRICA

Why Africa Has Been the Dark Continent.—In spite of the fact that northern Africa was the seat of a very early civilization, the continent as a whole is the most backward of all. It does not include a single independent nation of any importance. The three that may be classed as independent are Egypt, Abyssinia, and Liberia, all of which with difficulty maintain a national existence, and Egypt's independence is not complete. All the rest of the immense continent has been taken over as colonies, protectorates, or mandataries of European powers, notably of Great Britain and France. The vast majority of Africans south of the Sahara belong to the black races, and it is considered that these races are essentially the product of the tropical climate which dominates three-fourths of the continent.

1. The extreme unhealthfulness of long stretches of the coast of equatorial Africa has to a large extent deterred white people from settling there or even landing there. (2) The coast line of Africa is exceptionally regular, and the deep, protected indentations and the many peninsulas and islands which have done much for the commercial progress of Europe are wanting on the African coast. (3) The continent is, in the main, a plateau, and the rivers, flowing down the edge of the plateau to the sea nearly all have rapids and falls in their lower reaches. This condition has retarded exploration and commercial penetration. (4) Nearly half of the continent is in the tradewind desert belts. In all these particulars—vast inhospitable deserts, sweltering jungles, disease-infested coasts, unfriendly rivers, and backward races—Africa has been an unfortunate continent, but gradually one handicap after another is being reduced, and the Dark Continent is slowly yielding to civilization.

Political Control of Africa.—Four European nations have large colonial holdings in Africa (Fig. 315). Great Britain stands first, not in the extent of her holdings, but in their value. With the defeat of Germany in the World War, the German colonies passed under British and French sovereignty, and this gave Great Britain control of a broad belt of country extending the entire length of Africa (Fig. 315). Qualified independence has been granted to Egypt, but Great Britain retains control of the communications in that country. Britain also has a number of colonies in west Africa and controls both the north and south entrances to the Red Sea. France, whose African possessions are larger in extent than Great Britain's, has gradually extended her political and economic control over part of north Africa, including the Sahara, much of the

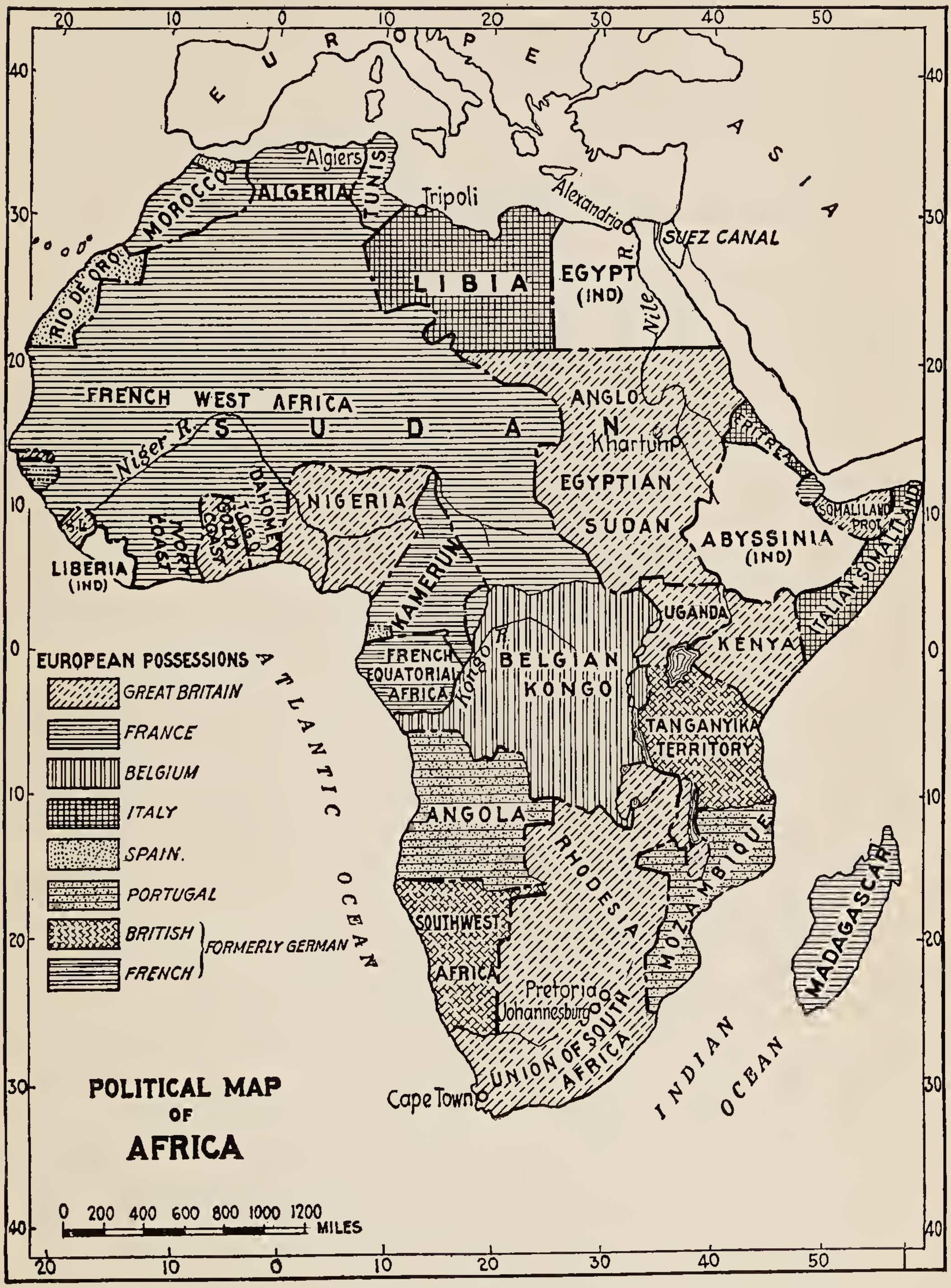

E U R O P E
A S I A
Algiers
ALGERIA
TUNIS
MOROCCO
RIO DE ORO
Tripoli
LIBIA
Alexandria
SUEZ CANAL
EGYPT (IND)
Nile R.
FRENCH WEST AFRICA
Niger R.
S U D A N
ANGLO EGYPTIAN SUDAN
Khartum
ERITREA
SOMALILAND PROT.
ITALIAN SOMALILAND
ABYSSINIA (IND)
NIGERIA
DAHOMEY
TOGO
GOLD COAST
IVORY COAST
S.L.
LIBERIA (IND)
KAMERUN
FRENCH EQUATORIAL AFRICA
Kongo R.
BELGIAN KONGO
UGANDA
KENYA
TANGANYIKA TERRITORY
ANGOLA
RHODESIA
MOZAMBIQUE
MADAGASCAR
SOUTHWEST AFRICA
Pretoria
Johannesburg
UNION OF SOUTH AFRICA
Cape Town
ATLANTIC OCEAN
INDIAN OCEAN
EUROPEAN POSSESSIONS
GREAT BRITAIN
FRANCE
BELGIUM
ITALY
SPAIN.
PORTUGAL
BRITISH
FRENCH
FORMERLY GERMAN
POLITICAL MAP OF AFRICA
0 200 400 600 800 1000 1200 MILES
20 10 0 10 20 30 40 50
40 30 20 10 0 10 20 30 40

Fig. 315.

Sudan, several colonies in west Africa, and the large island of Madagascar. Belgium controls the heart of tropical Africa, the great Congo basin, and Portugal holds an extensive colony on the east coast and one on the west coast of southern Africa. The holdings of Italy and Spain in Africa are relatively unimportant.

The colonies of Great Britain are the most promising. The Union of South Africa, is, like Canada, New Zealand, and Australia, a self-governing dominion of the British Empire. By controlling (1) the entire southern end of the continent, (2) an unbroken succession of territories from north to south (if the partial control in Egypt be included), (3) the Suez Canal, (4) both entrances to the Red Sea, and (5) Gibraltar, Great Britain is the dominating power in Africa.

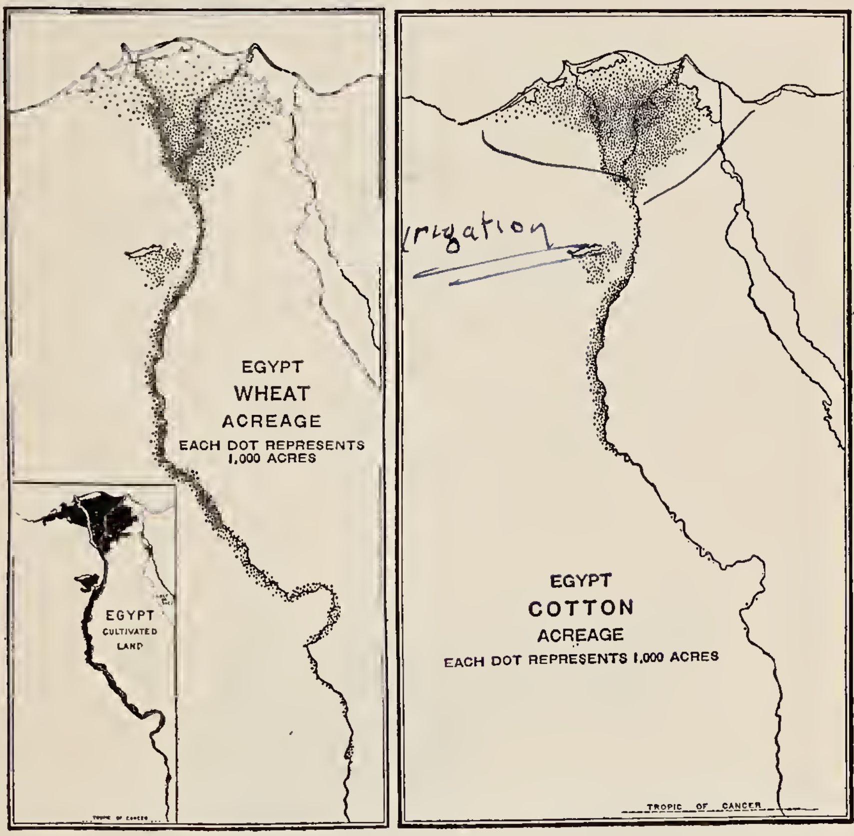
Egypt and the Sahara

Egypt and the Nile.—Were it not for the Nile floods and the irrigation which they make possible, Egypt would not differ from the rest of the Sahara. Of the 380,000 square miles belonging to Egypt, only 3½ per cent is irrigated and cultivated, yet on this small area (12,300 square miles) about 14 million people live, and the greater part of them live by agriculture. The density of population exceeds 1,000 per square mile, the most dense agricultural population in the world.

The Nile floods are mainly due to the periodic rise of two large tributaries which enter the Nile from Abyssinia, where the heavy downpours of tropical summer or monsoon rain greatly increase the volume of the rivers. The Nile Valley is a narrow cleft in the rocky plateau. Only a part of the valley width is flooded, and the cultivated part is a narrow ribbon of green from 1 to 9 miles wide (Fig. 316). The waters rise steadily from June to September, when they are from 30 to 50 feet higher than the low water level. From the plateau of Abyssinia the rivers bring to the Nile a continous supply of fertile mud which the river for thousands of years has deposited in a thin annual film upon its flood plain and this has preserved its fertility.

Methods of Irrigation.—Before the construction of the great dam at Aswan irrigation was mainly accomplished by the "basin system." Fields lying somewhat above the river were enclosed by earth embankments and were submerged at time of flood; when the flood waters subsided, the "basins" retained the water for a considerable time and most of it soaked into the ground. While the land was still wet, crops were sown and grew quickly. By this method—still in use in parts of Egypt—one crop a year can be obtained, although the higher fields fail to be submerged if the river does not rise to its maximum height. To prevent crop failures and to permit the raising of more than one crop a year, an extensive and costly system of irrigation works has been constructed by the British. A great masonary dam 1¼ miles long extends across the river at the first cataract (Aswan) and produces a reservoir of huge capacity. By means of gates, the stored waters and a part of the rich silt which they carry are released, and by means of canals they are conducted upon the fields as needed. Thus two and even three crops a year are raised in lower Egypt and the delta. Another dam, producing a reservior of large capacity, has been built farther up the river beyond Khartum. By means of these irrigation works the agricultural production of Egypt and the Sudan is being multplied many fold.

The Crops of Egypt.—The warm climate, and rich soil make the irrigated land of Egypt highly productive. Cotton, which constitutes 85 per cent of the value of the country's exports, is the outstanding crop, and because of its long fiber, Egyptian cotton commands a high price; the prosperity of the country depends upon this crop (Fig. 316). About as much land is devoted to wheat as to cotton, and even more to corn (Fig. 317), but both of these cereals are raised for home use. Beans, barley, and rice are other food crops.



irrigation

fertile soil and river irrigation

FIG. 316.—Crops, in Egypt, can be grown only on the irrigated lands of the delta and flood-plain of the Nile. (*U. S. Dept. Agr.*)

The Suez Canal.—In 1869 the French engineer, De Lesseps, brought to a successful conclusion at Suez the building of a ship canal 100 miles long which opened a short sea route between Europe and the East. The British, who at first ridiculed the canal, later secured control of it, and still hold that control, which they deem essential to the security of the empire. Though the canal narrowly escaped bankruptcy in the early years, it is now exceedingly profitable and earns dividends of 25 per cent or more a year. It has no locks, and cost only one-fourth as much as the Panama Canal. The rates of toll are about the same for each, and in 1928 the two canals had about the same amount of traffic. The importance of the Suez Canal to British commerce may be seen from the fact that two-thirds of the ships which use it are British.

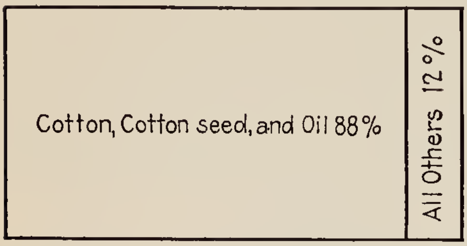


Fig. 317.—Cotton fiber, seed and oil make up 88 per cent of the value of the exports from Egypt.

The Sahara.—The Sahara is the greatest of the tradewind deserts (Fig. 318). In northern Africa the prevailing winds blow from northeast to south-west—from cooler to warmer regions—and so become *warmer* as they proceed. The precipitation of moisture comes from the *cooling* of the air, and since the tradewinds become warmer as they move across north Africa toward the equator, they yield little precipitation. Occasional downpours occur and there are deep canyons in parts of the desert, eroded by the temporary streams thus produced. The surface of the Sahara is rugged and even mountainous in places. Sand drifts with the wind, yet only about one-eighth of the Sahara is covered with sand. Oases, or places where the underground water comes to the surface or near it, are fairly numerous, and some of them are large, affording room for 300 or 400 villages which are occupied by dense populations. Grains, vegetables, and fruits are grown, especially the date palms of which

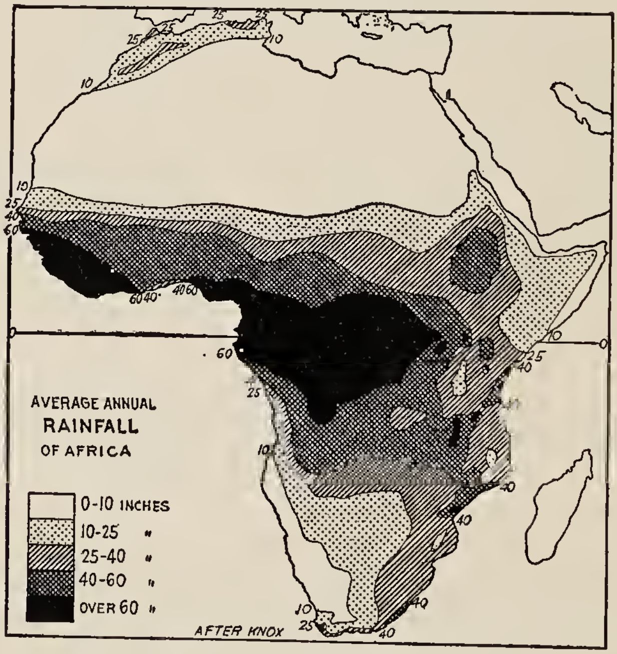


Fig. 318.—The white portion of Africa is the Sahara or Great Desert.

there are many varieties. The date gardens of the oases are said to command from $2,000 to $5,000 an acre. Formerly there were many caravan routes across the Sahara, reaching from oasis to oasis and goods of large value were carried by caravans that numbered thousands of camels. However, the commercial penetration of the Sudan by railroads from the south, has reduced the caravan trade to a small fraction of its former volume. France claims the greater part of the Sahara and is gradually bringing the wild desert tribes under subjection, though the process is far from complete.

The Sudan: Its Peoples and Products.—The Sudan is an east-west belt several hundred miles wide south of the Sahara (Fig. 318). It lies between the tradewind desert and the equatorial jungle, has a wet summer and a dry winter, as the belt of equatorial rains moves north and south. It consists mainly of grass land, with a southern margin of bush and scrubby forest. Its people are a medley of races with negroes in the great majority, but including also Arabs, Berbers, Abyssinians, and various other tribes, and all mixtures of these. Much of the Sudan is remote from the sea and the inhabitants of these interior regions have little contact with the outer world. When desert caravans were the chief means of transportation, the Sudan sent its gold dust, salt, ivory, ostrich plumes, and sometimes its slaves northward to the Mediterranean. But the caravan trade has declined greatly and an increasing amount of the products reaches the markets of the world through the Niger and Nile valleys both of which are penetrated by railroads that have worked wonders in promoting the productivity of the regions.

The natives of the Sudan carry on a desultory, primitive type of agriculture and the more progressive raise cattle "not for slaughter, still less for sale, but simply as a sign of their own importance." For a long time it was hoped by the British cotton spinners that the Sudan might become a large source of cotton and thus relieve them of their dependence upon the United States, but much of the cotton produced in the Sudan is inferior in quality and the difficulties of transportation rob the industry of profit, so that the total output is small. It may be that the Sudan will some day be of considerable commercial importance, but the general backwardness of the tribes and their utter distaste for regular labor can not readily be overcome.

The Commerce of West and Central Africa

West Africa More Accessible Than Corresponding Parts of East Africa.—The part of west Africa that has the largest volume of commerce is the region around the Gulf of Guinea, made up of British, French, and Belgian colonies. This is the part of tropical Africa most readily reached from Europe and America. It has two large rivers—the Niger and the

Congo—and both of these rivers and their branches, despite their rapids, have been of service in the more recent commercial penetration of the continent. A number of light railroads have been built from ports on the coast into the interior; in a few cases these railroads are 200 to 300 miles in length and they have greatly increased the commerce of the regions which they penetrate (Fig. 319).

How the Commerce of Tropical Africa Is Conducted.—The customary way of opening a colonial region to commerce is for the home government to charter a trading company which is given special rights and privileges for a period of years. The East India Company, the South Africa Company, and many others were thus chartered and undertook the commercial development of the lands allotted to them. This was done throughout tropical Africa. Many of the companies have had their charters terminated, and no longer have monopolistic privileges, although they may still continue their trading operations. Trading stations or "factories" belonging to Europeans are located at all the ports and at selected points in the interior. Besides these, there are great numbers of "huts" belonging to native traders scattered through the regions. Some of the native tribes living near the sea have developed marked ability as traders, and carry on a flourishing business with the natives of the interior. By offering them money, liquor, and showy goods, Europeans induce the natives to exert themselves somewhat more than they otherwise would; thus the collection of ivory, palm nuts, and other salable articles, and the cultivation of cacao, cotton, and a few other crops are increased. Because of a disease-bearing fly that infests parts of Central Africa, beasts of burden cannot be used there, and most of the moving of products to and from the trading stations and from place to place is done by negro porters who carry 50 to 100 pounds on their heads for distances up to 50 miles; this is a regular occupation in which thousands engage. Wherever possible navigable streams are used for transportation.

The Soil Products of West and Central Africa.—The major part of the commercial products of west Africa and the Congo basin comes from the forest, and the products of greatest value are the oil and kernels of the oil palm (Fig. 320). This tree, which grows in enormous numbers in the tropical rain forests, bears a massive cluster of fruits, often a bushel or more. Both the exterior pulp of the fruit and the kernel of the nut it encloses yield valuable oils. These are the palm oil and palm-nut oil which are used in soap manufacture, in the tinplate industry, and to some extent in the manufacture of edible products. Palm oil and palm kernels, collected by the natives and bought by the traders, form the largest export of the region; indeed, they form 70 to 80 per cent of the exports of several of the colonies, and the annual value has exceeded 100 million dollars.

In one of the colonies (Gambia) the raising of peanuts has grown to an industry valued at 25 to 50 million dollars a year. The British colony known as the Gold Coast, and two Portuguese islands in the vicinity, are producing great quantities of cacao beans, at present exceeding Ecuador and Brazil and providing about one-half of the world's supply of this increasingly valuable product. At one time wild rubber constituted 80 per cent of the value of the exports from central Africa, but it no longer can be profitably gathered and exported in competition with plantation rubber from the Far East, and the rubber-collecting industry of Africa has nearly ceased. A considerable part of the ivory of commerce comes from the tusks of African elephants, and at one time ivory formed 50 per cent of the value of all exports from the Congo region, but the total value of this product is no longer large. African mahogany in moderate quantities and a few other valuable woods reach the world's markets.

Mineral Products.—Gold from the Gold Coast and other localities, tin from Nigeria, and copper from central Africa are the leading mineral products. The copper deposits at Katanga in the Belgian Congo are very rich and produce more copper than all the rest of Africa. They are becoming one of the world's important sources of this metal. Diamonds in small quantites are found in central Africa, but the chief diamond mines are farther south.

Control of African Commerce.—The export trade of west Africa is already practically equal to that of the west coast of South America, but the United States has only a small part in it; it is largely controlled by the countries that control the respective colonies. Great Britain dominates the commerce of her colonies while France and Belgium do the same in theirs. This is made more easy by the fact that the home country usually establishes regular steamship lines to its colonies, while the United States has poor steamship connections with Africa.

Communications in Central Africa.—It has been pointed out that railroads have been built from the coast to various productive regions in the hinterland. Most of these railroads from the west coast are relatively short, narrow-gauge lines, but the main line from the south (Fig. 319) is nearly 2,000 miles long and forms part of the "Cape to Cairo" route.

The Congo River and its many branches form the chief transportation routes of central Africa, but the Congo is far from a satisfactory river for navigation, because (1) not far from its mouth there is a long stretch of rapids around which 200 miles of expensive railroad have been built; (2) another series of rapids in the middle course of the river, and still another farther up have to be passed by railroads; (3) the river flows in a great arc, making it a long route to the sea; and (4) it fluctuates greatly in depth from season to season. If, for example, copper from the

Katanga region were to seek an outlet to the sea by way of the Congo, it would have to be loaded on cars and steamers eight times and unloaded eight times before it reached the ocean. In some of the more progressive colonies a few roads for wheeled vehicles have been built, but they are rare, and in central Africa there is scarcely a modern road.

The great lakes of central Africa—nearly as large as the American Great Lakes—are navigated by steamships and other boats and are reached by a railroad from the east coast and by one from the Congo. Thus the east coast, the great lakes, the Congo, the west coast, and the south coast, are connected up by lines of river boats and lake boats and

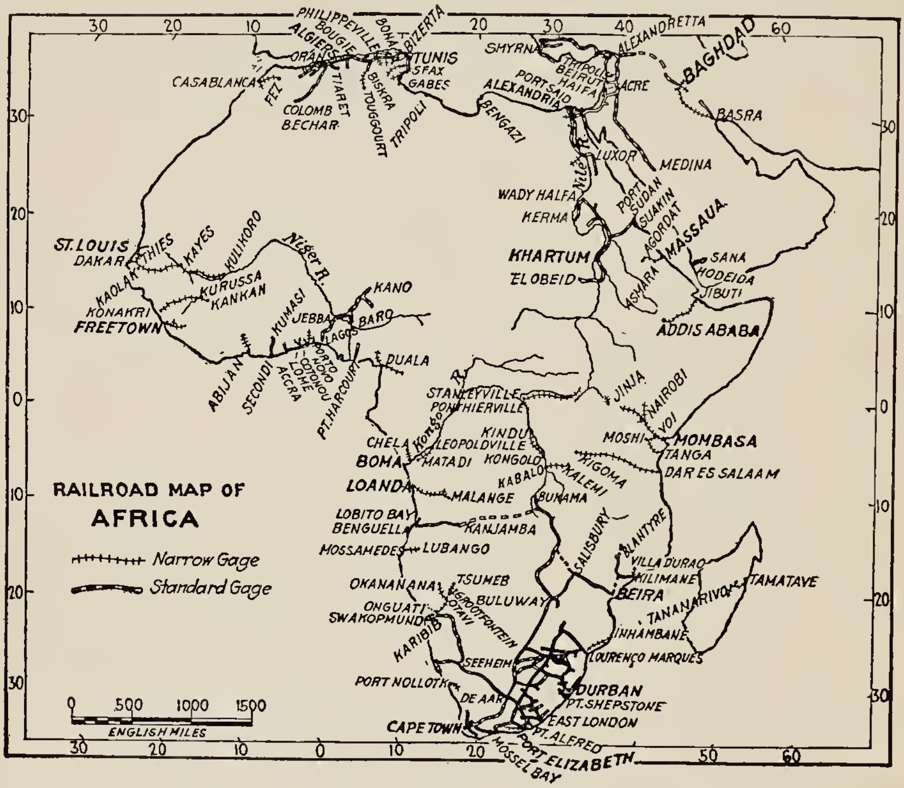

RAILROAD MAP OF
AFRICA
Narrow Gage
Standard Gage
0 500 1000 1500
ENGLISH MILES
30
20
10
0
10
20
30
40
50
60
PHILIPPEVILLE
BOUGIE
ALGIERS
ORAN
BONA
BIZERTA
TUNIS
SFAX
GABES
CASABLANCA
FEZ
TIARET
COLOMB BECHAR
BISKRA
TOUGGOURT
TRIPOLI
SMYRNA
ALEXANDRETTA
BAGHDAD
TRIPOLI
BEIRUT
HAIFA
ACRE
PORT SAID
ALEXANDRIA
BENGAZI
BASRA
LUXOR
MEDINA
Nile R.
WADY HALFA
KERMA
PORT SUDAN
SUAKIN
AGORDAT
MASSAUA
KHARTUM
EL OBEID
ASMARA
SANA
HODEIDA
JIBUTI
ADDIS ABABA
ST. LOUIS
DAKAR
THIES
KAYES
KULIKORO
Niger R.
KAOLAK
KURUSSA
KANKAN
KONAKRI
FREETOWN
KUMASI
JEBBA
LAGOS
KANO
BARO
ABIJAN
SECONDI
ACCRA
LOME
KOTONOU
PORTO NOVO
PT. HARCOURT
DUALA
STANLEYVILLE
PONTHIERVILLE
KINDU
Kongo R.
CHELA
LEOPOLDVILLE
BOMA
MATADI
KONGOLO
KABALO
LOANDA
MALANGE
BUKAMA
LOBITO BAY
BENGUELLA
KANJAMBA
MOSSAMEDES
LUBANGO
JINJA
NAIROBI
VOI
MOSHI
MOMBASA
TANGA
DAR ES SALAAM
KIGOMA
TABORA
SALISBURY
BLANTYRE
VILLA DURAO
CHILIMANE
BEIRA
TANANARIVO
TAMATAVE
INHAMBANE
LOURENÇO MARQUES
OKANANANA
TSUMEB
ONGUATI
OTAVI
BULUWAYO
SWAKOPMUND
KARIBIB
KEETMANSHOOP
SEEHEIM
PORT NOLLOTH
DE AAR
DURBAN
PT. SHEPSTONE
EAST LONDON
CAPE TOWN
MOSSEL BAY
PT. ALFRED
PORT ELIZABETH

Fig. 319.

y railroads. Yet these few lines of communication, valuable as they are, form a very meager system for such a vast country. The route to the north will be mentioned later in connection with the "All Red Route" from the Cape to Cairo.

The People of Tropical Africa and Their Mode of Life.—There are many millions of natives in tropical Africa, but the population is by no means dense, rarely averaging 10 to the square mile. The slave trade and the almost constant intertribal wars of the past, the diseases, and the unhygienic mode of life have kept the numbers down. In some sections the tsetse fly, whose bite gives the sleeping sickness, has depopulated whole regions.

There is an almost endless variety among the tribes. While all are dark, they are not equally so. Some (the pygmies) are very small of stature, weak, and retiring; others are tall, stalwart, and warlike. They are grouped in tribes, and each tribe has a somewhat definite area which it claims and occupies; the people usually live in villages and are under the rule of local chiefs. The European governments recognize the chiefs and seek their cooperation in all matters of government. In fact, most of the actual government in central Africa is carried out through the chiefs. In the Belgian Congo, for example Belgium recognizes over 6,000 chiefdoms.

The native African dislikes steady work of any kind, lives as lazily as he can, cultivates a little ground; in some cases keeps cattle, sheep, goats, pigs, or poultry, and possibly may be persuaded to take employment as a porter, miner, or other laborer. So much does he dislike work, however, that one of the most serious problems in the development of Africa is the shortage of competent labor. White men cannot and will not do manual labor to any extent in the tropics. If work is done, the colored man must do it, and he is very reluctant to change his habits of life. Each colony or protectorate has its nucleus of white officials and traders who, as a rule, are not permanent residents. In tropical Africa there are about 1,000 natives to every white person.

RELATIVE VALUE OF EXPORTS AND IMPORTS OF BELGIAN CONGO

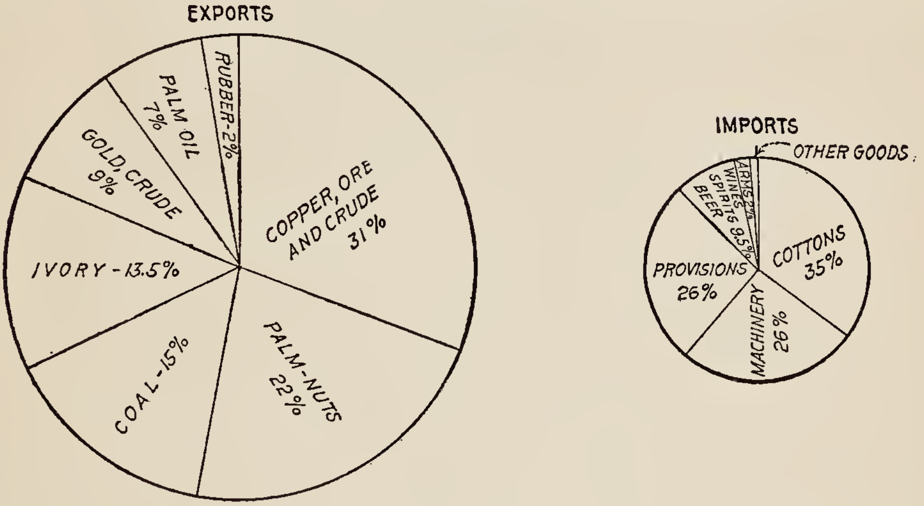


Fig. 320.

Tropical East Africa.—The east African coast, north of the equator, is virtually desert. South of the equator the entire region is under the control of Great Britain and Portugal. The Portuguese colony of Mozambique is of moderate commercial importance. It exports many thousand tons of peanuts which are mainly used in the preparation of peanut oil, and it yields various tropical products including sugar and copra. It is of considerable importance as a recruiting ground for laborers to work in the gold and diamond mines of South Africa. Its port, Lourenco Marques, is the terminus of the most direct railroad between the rich mining regions of South Africa and the sea, and because of this the road is much used. The Island of Madagascar, a French possession five times as large as New York State, has a population of between 3 and 4 millions, practically all natives. Cattle raising is a leading industry; there are twice as many cattle as people, and during the World War large quantities of meat and meat products were shipped to the Allies. Madagascar is one of the principal sources of graphite, one of whose uses is in making the "lead" of lead pencils. Another leading graphite region is the island of Ceylon.

The British protectorate of Uganda, a highland region in east Africa is said to have nearly 3 million acres under crops. Most of this land is crudely cultivated by natives, but there are upwards of a hundred European plantations. This is one of the few areas of Africa that are making much progress in the production of cotton. Owing to its more rugged topography and greater distance from Europe, east Africa is commercially less important than west Africa.

South Africa

The Union of South Africa is one of the self-governing dominions of the British Empire. Four states—the Cape of Good Hope, the Orange Free State, the Transvaal, and Natal—make up the Union. Of the 7 million people, nearly 5 million are native blacks, referred to as Kaffirs; almost another million are Hindus, Malays, or other Asiatics who have come into the country as laborers; and upwards of a million are whites. The white element is partly British and partly the descendants of Dutch colonists called Boers. The latter are mainly farmers while the British are mainly connected with mining, commerce, and financial affairs. Owing to the conflicting elements in the population in South Africa there is less harmony than in the other self-governing British dominions.

South Africa Not Well Suited to Agriculture.—South Africa is almost entirely a plateau whose rough and rocky surface averages over a mile above sea level. The southeast tradewinds bring moisture to the eastern coastal strip but little to the *veldt*, as the plateau is called, and the western half of South Africa is almost complete desert (Fig. 318). Not over 10 to 20 per cent of South Africa receives enough rainfall to make farming profitable, and not enough food is raised to supply the needs of the people. Corn—called *mealies*—is the chief food crop of the natives, and is raised in the moist southeastern section. On a small scale irrigation and dry farming are practiced, and some sugar, cotton, tobacco, fruits, wheat and other crops are raised, but the lack of rainfall precludes any large agricultural development.

The Veldt Mainly a Grazing Region. *Sheep.*—Though not one of the largest sheep-raising regions, South Africa ranks about fourth in the world in total number of sheep (about 40 million). They are mainly Merinos, raised for wool more than for meat; and wool is the largest non-mineral export of the country. It is another case of the utilization of semi-arid mild-temperate lands for sheep raising.

Goats are kept in large numbers (10 to 12 millions), and South Africa ranks high in this industry (Fig. 321). Goat herding is suited to rough, semi-arid (or even arid) lands, for the hardy animals can live on the scantiest of pasturage; they seem to be about the last resort in the utilization of dry, rugged lands in many parts of the world. The hair of the Angora goat, which is extensively raised in South Africa, is in demand for making certain cloths, and goat and kid skins, one of the chief leathers used for light shoes, are an important export. On the whole, the despised goat is a far larger factor in the world's affairs than he is given credit for being. The United States, for example, imports something like 30 million goat skins a year, largely from Asia.

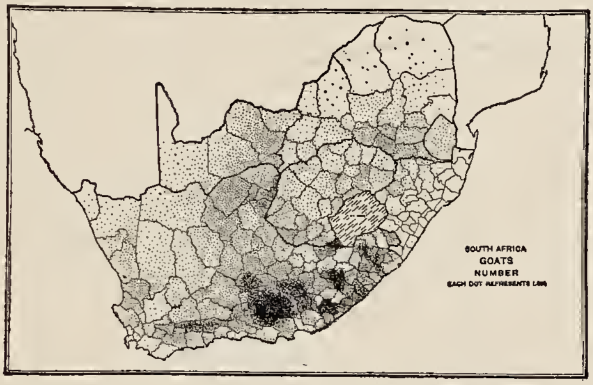


Fig. 321.—The mohair crop of South Africa is produced by Angora goats which graze the semi-arid hills. (*U. S. Dept. Agr.*)

Cattle.—South Africa has more cattle than it has people, and oxen are the principal draft animals everywhere in the Union. Most of Africa has more than its share of insect pests that attack and annoy cattle and horses. These pests are so bad that they constitute one of the reasons why few horses are kept in tropical Africa or South Africa. Cattle resist them better than horses, yet the cattle tick is a persistent menace and must be fought constantly.

Ostrich Farming.—Years ago ostriches were brought into South Africa and partially domesticated. The graceful plumes from the tails and wings of these huge birds have at various periods commanded high prices in Europe and America, and this suggested the possibility of rearing ostriches in enclosures, plucking the feathers at certain intervals, and thus making a permanent industry of ostrich farming. Prior to the World War this industry attained such magnitude in South Africa that about 300,000 ostriches were supplying plumes valued at 10 to 12 million dollars a year—or a quarter of the value of the diamonds shipped from the country. The birds are carefully reared and are fed abundantly, for only thus can the highest quality of plumes be procured. But ostrich plumes are a luxury and are peculiarly subject to the whims of fashion. At times they are in great demand, and prices soar; at other times they pass out of fashion, prices fall, and the industry in South Africa, Arizona, and Australia temporarily faces ruin. For example, in 1910, the United States imported 7 million dollars' worth of ostrich feathers, two years later 1¼ million dollars' worth, and in 1927 only 200,000 dollars' worth.

THE MINERALS OF SOUTH AFRICA

The Diamond Mines.—Over 95 per cent of the diamonds that annually come upon the world's markets are mined in South Africa. The principal mines are in the vicinity of the city of Kimberley, though the famous Premier mine is at Pretoria, and diamond fields of considerable importance are found in several places. The diamonds are obtained from the "blue ground" which is mined from what appear to be the necks of old volcanoes, although no volcanic cones rise above the surface of the ground at these places. The blue ground is mined, brought to the surface, spread on smooth areas and allowed to weather; in some cases, it is harrowed to hasten the process. When thoroughly disintegrated, the earth is put through washers which separate the finer material from the pebbles, fragments of rock, and the rough diamonds, and by an ingenious sorting process the diamonds are afterward separated from the pebbles and rock fragments and are sent to New York, London, Paris, but especially to Amsterdam, to be cut into gems.

The principal diamond mines are under the control of one company that has a virtual monopoly and sees to it that diamonds are supplied to the market gradually so that prices keep moving upward. Most of the work in the mines is done by natives who are kept constantly in enclosures or compounds during their period of employment so that they cannot steal the diamonds. Only by the most rigid control of the workmen can the stealing of diamonds be held within narrow limits. The annual output of rough diamonds is valued at 40 to 50 million dollars, but the final selling price of the cut diamonds is many times this amount.

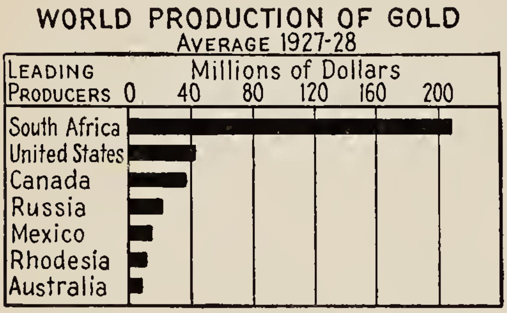


Fig. 322.

The Gold Mines.—In the Transvaal is a range of granitic hills caused by the extrusion of lava ages ago. This range is rich in gold, and the "Rand," as the region is called, is the greatest gold-producing region that has ever been known. About one-half of the gold mined in the world comes from these mines (Fig. 322). The ore does not contain a large amount of gold per ton, but it is remarkably uniform and dependable. The most expensive modern machinery is used, and the number of employees runs up beyond 200,000 only one-ninth being whites. The output of gold has reached 200 million dollars a year, or double the highest production ever reached by the United States, the second largest gold-producing country. Great as this sum appears, it is less than the value of the corn produced yearly in Iowa or Illinois.

Coal Resources.—So far as known, Africa is poor in coal. By far the most valuable deposits of the continent are in the Transvaal. The coal is of fair quality and its presence here is of utmost advantage to the mining and transportation interests, for without native coal for power. South Africa would fare badly. Natal has coal that is well suited to the use of steamships, and it supplies much of the bunker coal used on the Cape of Good Hope steamship route.

Transportation: The Cape to Cairo Route.—Since the interior of South Africa is a mile above sea level and the face of the plateau rises steeply from the coast, railway entrance to the interior is difficult. A half-dozen lines, however, connect ports on the south and east coasts with the cities on the veldt; Cape Town, Durban, and Lourenço Marques are important termini. The more thickly populated parts of the Union of South Africa have reasonably adequate railway facilities, but freight rates are high. The great empire builder of South Africa, Cecil Rhodes, conceived the idea of a railway extending the entire length of Africa, from Cape Town to Cairo. During his lifetime Great Britain did not possess a continuous line of dependencies from end to end of Africa, nor does it now, since Egypt is considered to be independent. A route already exists, but not all by rail. Trains with dining and sleeping cars run northward from Cape Town to the Congo River, a journey of 9 days. Through central Africa the route continues by river steamer and by train for 12 days; thence the route leads overland by road to the Nile, a journey of about 2 weeks; thence by Nile steamer and railroad to Cairo, about 3 weeks. Thus the journey of 7,000 miles is completed in 8 weeks. It will be many years before the entire journey can be taken by rail, but it will surely come.

The Future of South Africa.—At present the economic life of South Africa is one-sided, for 80 per cent of its exports are the products of its mines. The life of the country centers around gold and diamonds, but these resources cannot last; in the meantime more permanent industries must be built up. At present agriculture does not produce enough food for the people and large amounts are imported. The scanty rainfall of the veldt precludes prosperous agriculture and limits stock raising, which is better suited to most of the country than is general farming. The climate is agreeable and the white people who have made their homes in South Africa come to love the country and to prefer it to any other. Coal is reasonably abundant in this part of Africa and this forecasts the possible future development of manufacturing, which now scarcely exists. The great colony of Rhodesia, north of the Union of South Africa, is potentially rich in minerals, and is suited to tropical agriculture and stock raising, and it seems probable that the time will come when this vast British domain in the southern part of Africa may be the home land of an important nation.

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CHAPTER XXXVI

AUSTRALIA AND NEW ZEALAND

The Commonwealth of Australia

The Remoteness of Australia and the Consequence.—Australia and New Zealand are on the opposite side of the earth from Europe; from London to their ports is a 12,000-mile journey, and this remoteness has had a retarding effect upon their development. (1) The long and expensive sea voyage naturally has deterred many from going there, and the total population of Australia, after a century of settlement, is only 5½ millions, or less than that of New York City. (2) The distance between Australia and other advanced nations has encouraged in the Australian people a notable independence of thought and action in political matters. In their distant land they seem to have thrown off the fetters of tradition. Many of their laws and governmental policies are unlike those in other countries; some would say these laws and policies are in advance of those of most countries. (3) Distance from Europe and the consequent cost of transportation has a constant influence upon the kind of products that Australia can profitably raise and export to Europe, for only the more concentrated products will stand the expense of the long sea journey.

The Agricultural and Pastoral Industries.—Australia is the smallest of the continents, yet it is as large as the United States. However, the total land under cultivation is only about half the area of one of our medium-sized states such as Illinois. This is mainly due to the lack of rainfall, and the lack of rainfall is due to two geographical factors: (1) The greater part of Australia lies in the belt of the southeast tradewinds, and (2) the principal mountain range of Australia extends north and south along the eastern side of the continent and quite close to the shore. Lying as it does on the windward side of the continent, this range of mountains forces the moisture-laden tradewinds, blowing in from the sea, to rise several thousand feet soon after they reach the land. Thus, they are cooled and forced to precipitate nearly all of their moisture on the narrow eastern slope of the Dividing Range (Fig. 323). On the western slopes the rainfall decreases westward from 30 to 10 inches and less on the nearby plains. On the tropical northern coast the rainfall is of the monsoon type but of short duration, while in the south and southwest winter rainfall of a truly Mediterranean type prevails. More than one-third of Australia is complete desert, and another third has too little rainfall for agriculture. No other continent is so badly handicapped by the lack of water. If Australia, with its vast stretches of level or rolling land and its mild climate, had ample rainfall (30 to 40 inches) it could be one of the greatest food-producing regions of the world.

The Foremost Sheep-raising Country.—The world over, semi-arid lands are used for sheep grazing. Wool is a commodity of high value in proportion to its weight; it is not perishable—can be stored and shipped without damage, and, on the whole, is an ideal product for countries far removed from the great centers of population. The temperature in Australia is mild, and no winter housing of the sheep is necessary. They can graze out of doors all the year. Sheep are more healthy on dry soil than on moist, and are at their best where the rainfall is between 10 and 20 inches a year. It is entirely fitting that Australia, with its remote situation and its vast stretches of semi-arid pastures, should be a sheep-raising country (Fig. 324). Nearly half of the 100 million sheep of Australia are in New South Wales, on the western slopes of the Dividing Range and the adjacent plains (Fig. 325). In the past some of the sheep men held enormous tracts of land and counted their sheep by tens of thousands; but with each decade more of the pasture land has been given over to agriculture or to dairy cattle; there has been a cutting up of the large land holdings into smaller tracts, and a gradual reduction in the total number of sheep. Occasionally disastrous droughts visit the country, and sheep and cattle, especially on the desert margin, perish by the millions. The terrible drought of 1901 to 1902 caused a total loss of 600 million dollars, and a 6-year dry period caused the death of 60 million sheep and 4 million cattle. A majority of the sheep are Merinoes, a variety that yields large fleeces of extra fine wool, and Australian wool commands a higher price than that of almost any other country. Since the introduction of refrigerator ships, increasing quantities of chilled or

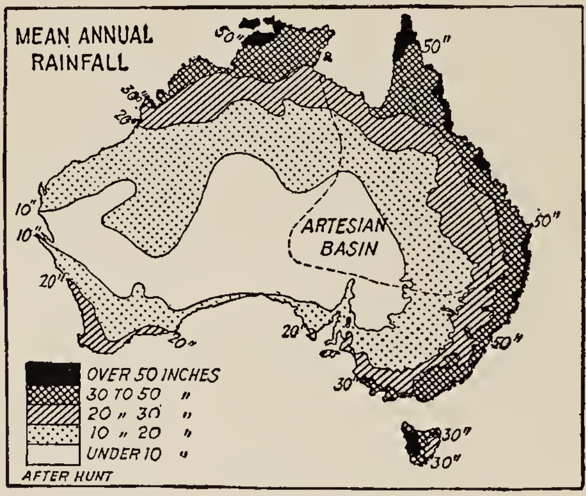

Fig. 323.

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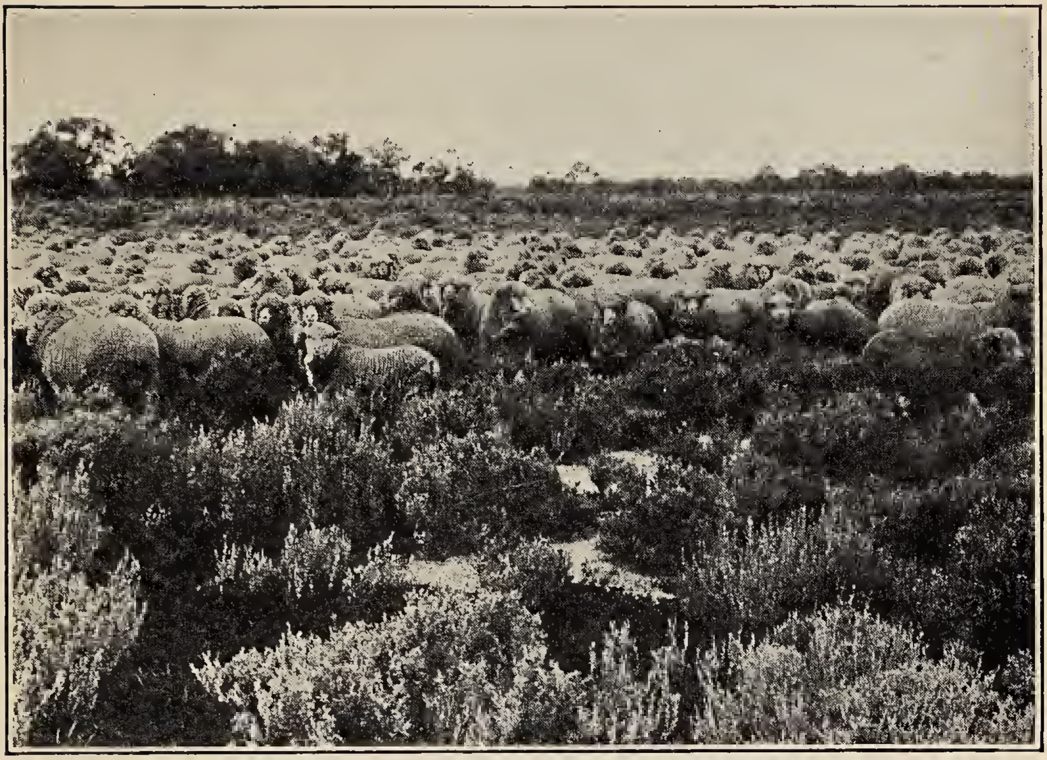
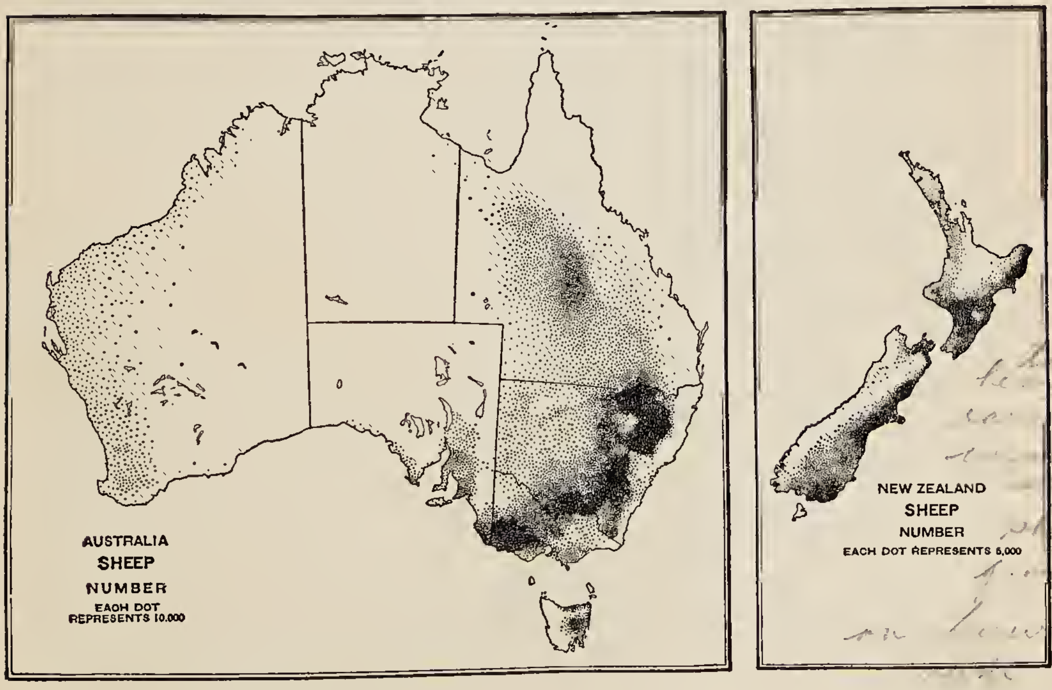


Fig. 324.—Sheep on salt-bush range on the semi-arid "back slopes" in central New South Wales. (*U. S. Dept. Agr.*)


AUSTRALIA
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NUMBER
EACH DOT REPRESENTS 10,000
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Fig. 325.—The principal sheep lands of Australia are the rolling surfaces of the "back slopes" of the mountains; drier than the coast, but not desert. (*U. S. Dept. Agr.*)

frozen mutton are sent to England, and this has led to the rearing of cross-bred sheep, which yield both large fleeces and good mutton. Wool is the most valuable product of Australia; it has a much greater annual value than wheat, which is the leading agricultural product. Wool far exceeds in value all of the gold, silver, coal, copper, lead, and other minerals produced in the country.

Meat, Dairy, and Fruit Industries and Their Relation to Refrigeration.—Before the days of cold storage, refrigerator cars, and refrigerator ships, perishable commodities could not be produced for export in Australia or in other remote countries. But under modern transportation conditions, butter, meat, and fruit are loaded at Australian ports and delivered in England in perfect condition at a total cost for transportation of from 1 to 3 cents a pound. The dairy industry has become established in the cooler, more humid, and most densely peopled portions of the southeast. In Queensland and the Northern Territory beef-cattle ranges of great extent are still maintained (Fig. 326). Several years ago the production of butter had already reached 300 million pounds a year, and the annual value of all animal products exceeds $500,000,000, which is 25 per cent greater than the value of agricultural products.

Australia, including the island of Tasmania which is one of the states of the Commonwealth, has a number of features that are favorable to fruit growing. The irrigated lands of Australia, like our own western orchard lands with their bright sunshine and mild temperatures, produce beautiful fruit. Australian apples come into American and European markets in the northern spring, and consequently sell at high prices. Extensive vineyards of raisin and wine grapes are grown under irrigation in the Mediterranean climatic region east of Adelaide, and great quantities of fruit jams and marmalades are put up for the Englishman's breakfast; 80 million pounds of jam have been produced in a single year. For this industry as well as for general consumption, cane sugar is produced in the tropical part of Queensland.

Wheat the Leading Crop.—It has already been pointed out that wheat is the staple crop of temperate plains in the newer countries. It keeps well, and is always salable. Moreover, wheat is one of the crops that can resist dry weather; and under mild temperatures and moderate winter rainfall wheat is raised on the undulating plains of the Australian "back slopes" on an extensive scale comparable with that of the Columbia Plateau of the United States. Wheat occupies as much land as all other crops combined; however, the yield is rather low—only 10 or 12 bushels to the acre (Fig. 327). It is all shipped in bags and during the dry summers these are often stacked in the open air in piles containing tens of thousands of bushels. Australia holds about sixth place among the wheat exporting countries, shipping the surplus mainly to the British Isles.

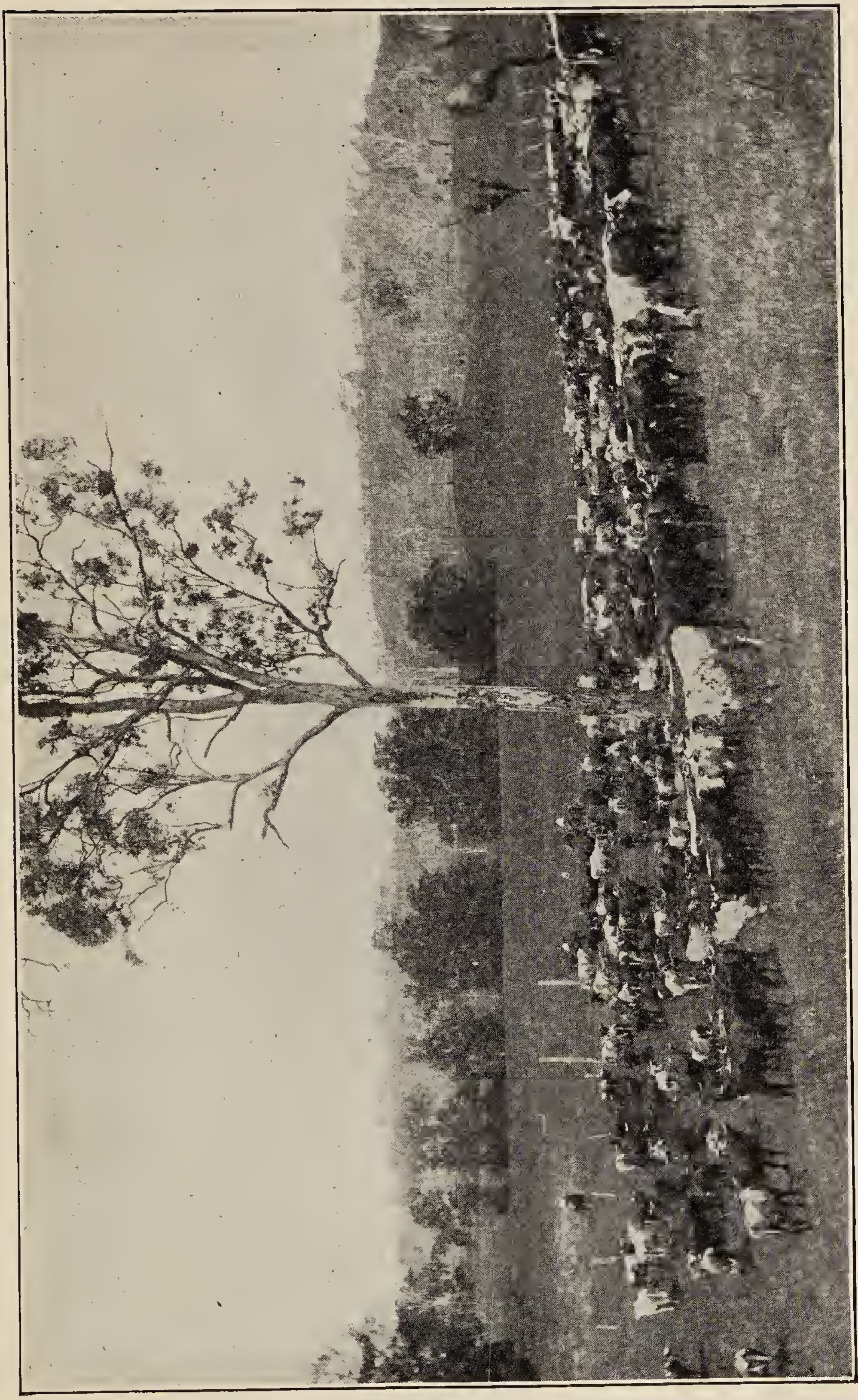

Fig. 326.—Beef cattle in the humid coastal district of Queensland, near Brisbane. (*U. S. Dept. Agr.*)

The Rabbit Pest.—Years ago, somebody brought rabbits to Australia, little dreaming that this act would cost the Australian people uncounted millions of dollars. The native animals of Australia are unlike those of any other continent, and practically none of them prey upon the rabbits, which have multiplied past all control, and have become a most destructive pest. They eat up every green thing within reach, and destroy the sheep pastures over wide areas. Hunting, trapping, and poisoning them had little effect in reducing their numbers. In dry lands the occasional water holes were fenced in with wire netting against which the rabbits in search of water hurled themselves and perished by hundreds of thousands. Owners of the land employ rabbiters who with dogs, traps, and poison, destroy thousands of rabbits daily. Rabbit-proof fencing has been built around the fields and pastures—over 45,000 miles of it in the single state of New South Wales. This has been quite effective. More recently the rabbits have been killed, dressed, frozen, and shipped to Europe for meat; and the fur is used, especially for making the felt for felt hats. In a single year the United States has imported 5 million rabbit skins from Australia. Thus, it has become profitable to hunt the "vermin," as they are legally termed in Australia; yet the pest is far from conquered and will long continue to harass the farmers and stockmen.

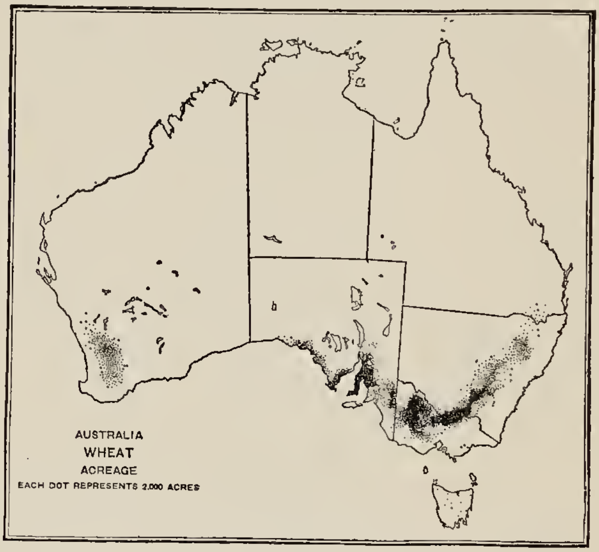

Fig. 327.—The wheat belt of Australia lies, for the most part, in the region of Mediterranean type of climate. (*U. S. Dept. Agr.*)

The Ceaseless Fight against Drought.—Over vast stretches of Australia, the ever-present problem is that of getting water enough for the cattle and sheep and for such crops as the farmers attempt to raise. West of the Dividing Range, and more especially in New South Wales, is an area larger than France or Germany which is subject to extreme fluctuations of rainfall. In the best years, the rainfall is sufficient for crops, but in the bad years—which are the more frequent—the country is brown and sear. A half-dozen irrigation works of considerable size have been constructed. Though the amount of land that can be irrigated is small, the yield of crops per acre on these lands is high. But neither dry farming nor irrigation has yet done very much to redeem these lands from drought.

Artesian Wells.—A basin including 570,000 square miles in east central Australia has artesian water below the surface (Fig. 323). Thousands of artesian wells have been drilled to depths of 4,000 to 5,000 feet; the water is warm, and in some wells even approaches the boiling point. As a rule the water is all alkaline; but generally it can be used for watering the cattle and sheep, and the wells along the great stock-driving routes are indispensable. The tens of thousands of sheep and cattle that are driven along these routes to markets or to railroad shipping points could not survive without the water from these wells.

THE MINERAL WEALTH OF AUSTRALIA

The Far-reaching Importance of the Gold Discoveries.—Gold was discovered in Australia in 1857, shortly after the California gold rush. Before this date Australia had attracted but few voluntary settlers. The total white population in 1850 did not reach a half-million. But, no matter how remote the land, men will flock to it if gold in promising quantities is discovered. The gold was found in placer deposits of remarkable richness; hundred of nuggets weighing 5 pounds or more were discovered; one of them was worth $50,000. Within 10 years, two of the gold fields had yielded 490 million dollars. Population increased rapidly, and many who failed as miners stayed to take up other occupations. New gold fields have been discovered every few years, the most important of the later discoveries being in west Australia, in a region of absolute desert to which water has to be piped for 350 miles from the more humid coast. The high point of gold production evidently has been passed, and Australia now ranks low as a gold producer.

Australia the Leading Coal Producer of the Southern Hemisphere.—The principal coal mines of Australia are on the seacoast of New South Wales at Newcastle and Sydney at the water's edge. The coal is a medium-quality bituminous, and is widely used by steamships in the South Pacific. Some of it reaches the west coast of the United States and the west coast of South America. The coal deposits are large and will be of permanent value in building up of the manufacturing industries of the Commonwealth.

Other Minerals.—Partly because of its large size, Australia has a large variety of mineral resources, and undoubtedly has others that yet remain undiscovered. Much of the continent is desert, and the chance of discovering minerals in the desert parts is small, yet two of the most important mining regions of Australia are either in the desert or on its edge. Large quantities of silver, lead, and copper and considerable quantities of tin, zinc, and iron are being mined. The Broken Hill region in New South Wales is one of the famous mining camps of the world. The various mines of the Broken Hill region have already yielded upwards of 700 millions dollars in silver, lead, and zinc.

Manufacturing and Commerce.—Australia is essentially a new country and has not yet attained the number of people necessary to make manufacturing on a large scale profitable. Modern factory manufacturing requires a large outlay for plants and machinery. To operate most economically, such a plant must turn out its products in large quantities and must be able to market them in large quantities; otherwise the economics of large-scale production can not be secured, and foreign competition cannot be successfully met. Australia has so few people that the home market for manufactures is necessarily limited. Manufacturers can not sell enough of their products within the country to justify the erection of large modern factories for the manufacture of, say, printing presses, typewriters, office furniture, and hundreds of other articles. On the other hand, flour mills, saw mills, shoe factories, and other factories which make products used by almost everybody can operate successfully in a country of small population like Australia. Australia has sought to stimulate manufactures by imposing a protective tariff on imported goods, and has in some cases gone beyond this and has paid a bonus to manufacturers to aid them in gaining a start. Since the country has coal, iron, capital, intelligent labor, and men capable of directing large enterprises, and has many forms of raw material, there is only one reason why manufacturing has made only moderate progress, and that reason is the limited home market due to the small population.

Most of the factories in Australia are small, rarely employing as high as 1,000 men. The average number of employees per factory is between 30 and 40, and the average power used in a factory is only 80 horsepower, which could be furnished by one small engine. Taking into account all so-called mills and factories, their total product amounts to somewhat over 2 billion dollars a year, equal to the manufactures of Indiana.

The Distribution of Population.—From what is said in the preceding paragraph on manufacturing, one might be led to believe that most of the people of Australia live in the country rather than in cities, but this is not the case. Forty per cent of the population lives in the six capitals of the states. Half the population of the state of Victoria lives in the capital, Melbourne. So important is the matter of rainfall that 80 per cent of all the people of Australia live in a belt 100 miles wide along the eastern and southeastern coast. It is said that half the population of the Commonwealth lives within range of the guns of a battle ship, if it were permitted to enter the harbors.

Of the 6 million people in Australia, 2.4 million live in New South Wales, and 1.8 million in Victoria. Sydney and Melbourne each has approximately a million population. Settlers come very slowly, and the population grows mainly by natural increase of births over deaths. Immigrants belonging to the colored races are not wanted. The Australians are determined to maintain a "white Australia" and 95 per cent of the people are of British descent.

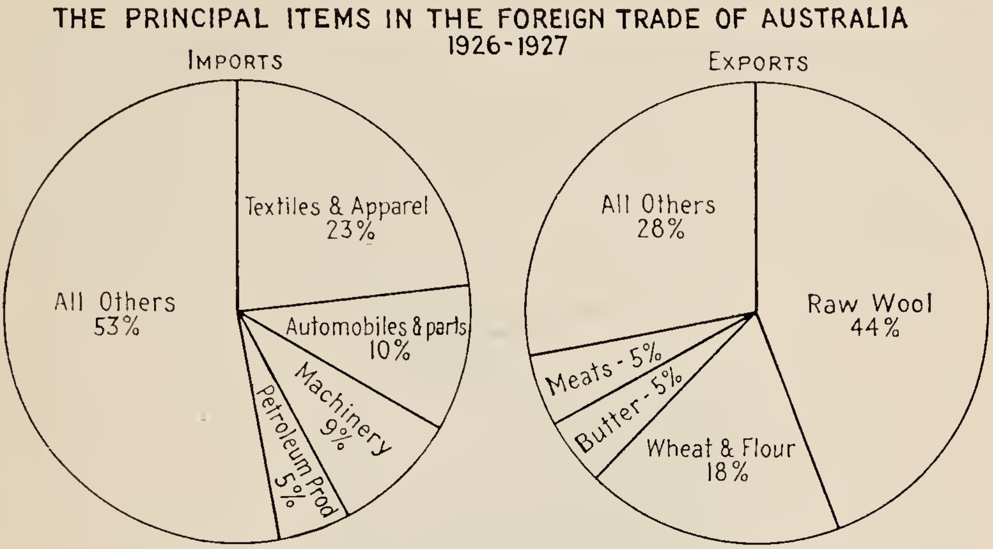

FIG. 328.—The character of Australia's foreign trade shows a large surplus of agricultural products and a lack of manufactures.

The High per Capita Value of Overseas Trade.—Countries like Argentina, Canada, and Australia have a very large overseas trade in proportion to their populations—much larger than the United States. They are countries of large agricultural and pastoral wealth; produce vastly more than their limited populations can consume; buy a large part of their manufactured goods abroad, and thus have a large foreign trade. Austra-

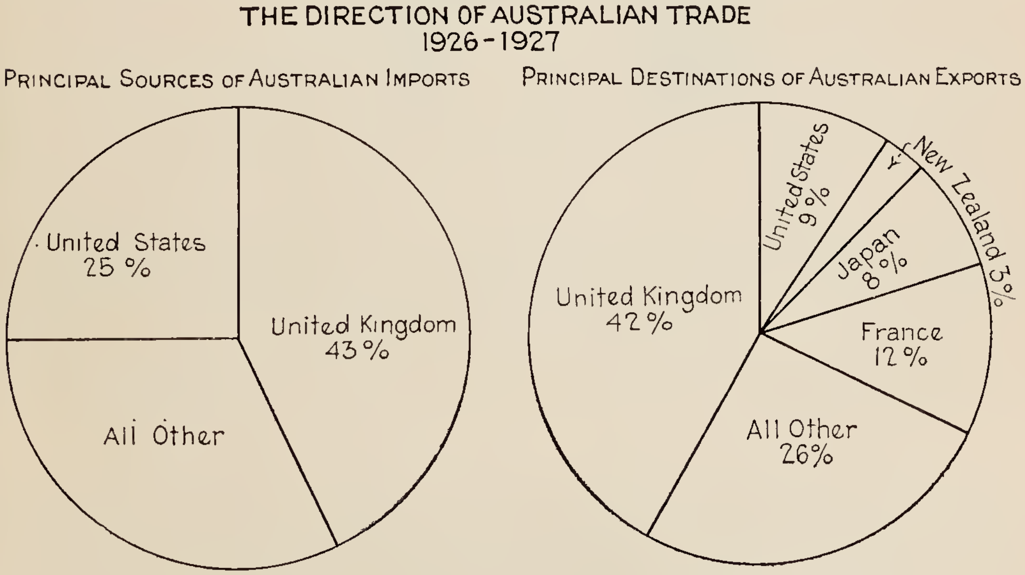

FIG. 329.—The United Kingdom dominates the trade of Australia.

lia exports annually over $100 worth of products for every person in the Commonwealth, and imports somewhat more, making an overseas trade in excess of $200 per capita, a total of 1½ billion dollars a year. If the United States had the same per capita foreign trade as Australia has, it would amount to over 30 billions of dollars a year instead of 8 or 9 billions, as it does (1928). More than half of the overseas commerce of Australia is carried on with Great Britain and the British possessions. The United States has built up a large export trade with Australia (25 per cent of Australia's imports). Products derived from animals—wool, sheep skins, meat, hides, and butter—make up the largest group of Australian exports. Products of agriculture, especially wheat and flour, make up the second group in point of value, while minerals—gold, coal, copper, lead, tin, zinc—make up the third group. Manufactures of all kinds constitute the greater part of the imports. Australia has excellent ports, the two most used being Sydney and Melbourne which handle the major part of the foreign trade of the country.

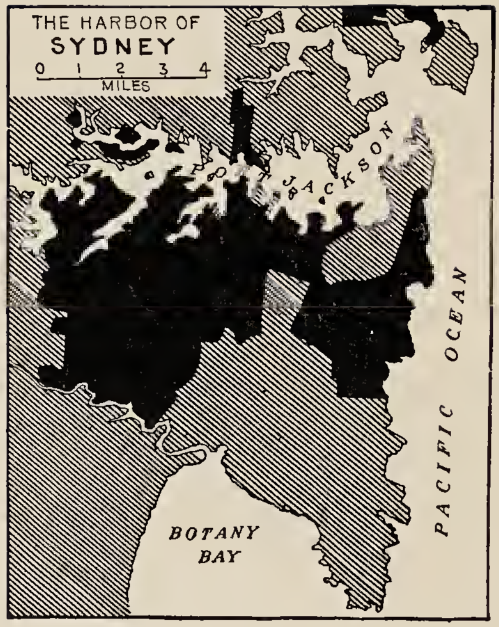

Fig. 330.—Port Jackson, the excellent harbor of Sydney, Australia. City area of Sydney shown in black.

The Dominion of New Zealand

The Land and the People.—New Zealand is almost exactly on the opposite side of the earth from the British Isles, and consequently is very remote from Europe and from eastern United States. It began its development later than Australia (about 1840). The long and costly sea voyage from Europe has deterred settlers from going there, and has made it necessary for New Zealand also to specialize in concentrated products for export. The area is about equal to that of England, Scotland, and Wales combined; but the population is somewhat over 1 million. The climate is moist, temperate, and bracing. About two-thirds of the land is suited to agriculture or pasturage. English grasses grow well, and most of the crops of the temperate and subtropical zones can be raised. The food-producing possibilities of New Zealand are probably equal to those of Japan with its 60 million people.

Nearly all of the people are of British extraction, and have the same vigor and same independence of thought and action that characterize the Australians. New Zealand is one of the self-governing dominions of the British Empire. Wellington, the largest city, has, with its suburbs, a population somewhat exceeding 100,000. Although New Zealand is a land of farms and ranches, half the people live in towns or cities.

A Land of Pastures, Cattle, and Sheep.—For three main reasons New Zealand is distinctly a pastoral country: (1) Its mild, moist climate favors the growth of grass, and permits cattle and sheep to graze in the open all the year around. (2) The labor supply is small in proportion to the extent of the country, and this condition favors the pastoral industry which requires less labor than does agriculture. (3) Animal products—wool, frozen meat, butter, and cheese—are concentrated products of high value per unit of weight and can stand the cost of a long journey to market.

Nearly seven-eighths of the improved land of the islands is devoted to the pasturage of some 25 million sheep (Fig. 325) and 3¼ million cattle. Swine are unimportant.

Animal Products in New Zealand's Exports.—New Zealand is one of the foremost countries in the per capita value of its exports. In years of moderate commercial activity these exceed $150, and have exceeded $200. It has already been pointed out that mainly countries of small population and large production, such as Argentina, Cuba, Uruguay, Canada, Australia, and New Zealand, attain such high figures. No less impressive is the fact that about eight-ninths of the exports (in value) are animal products.

	Per Cent
Butter and cheese form about	30–35
Wool about	25
Meat about	20
Hides and skins	5

The only other country of the world whose export trade shows such a preponderance of animal products is Uruguay (page 314). The real prosperity of New Zealand dates from 1882 when the first line of refrigerator ships began running between New Zealand and Great Britain, and made possible the shipping of frozen meat. This development of refrigeration has worked a remarkable change in the character of the products that can be profitably raised and grown in distant parts of the world, like Australia, New Zealand, and Argentina. This applies especially to meat, fruits and dairy products.

Other Industries of New Zealand.—Agriculture supplies only a little more food than the home market demands. Nearly one-fourth of the land is forest-covered and the sawing of lumber is prominent among the limited manufacturing industries of the Dominion. Gold and coal are mined in considerable quantities (about 10 million dollars a year each). An interesting industry, followed by several thousand workers, is the digging of *Kauri gum,* the fossilized resin from a species of pine tree. It is dug from the ground where these forests once grew, and is exported to be used in making the very finest kinds of varnish.

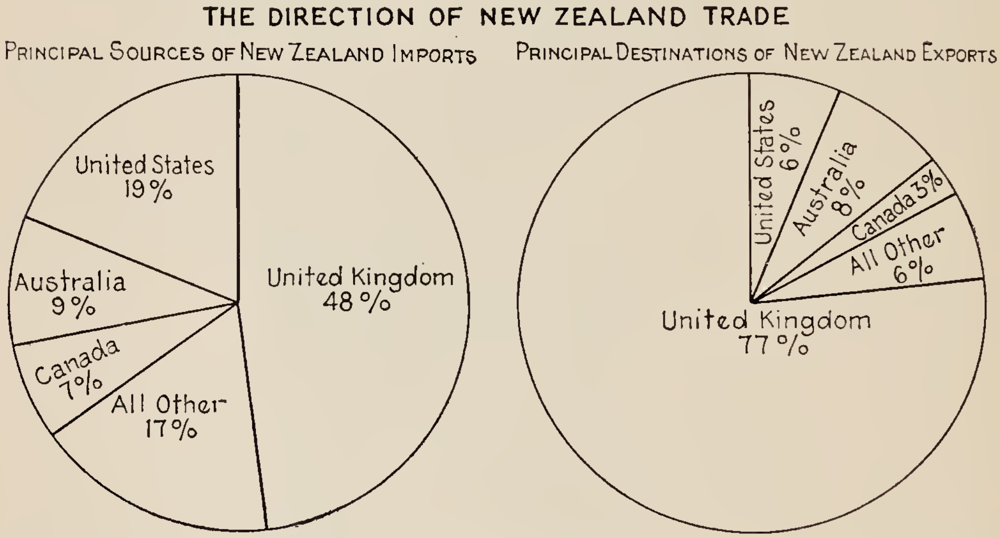

FIG. 331.—The United Kingdom has more than half of the trade of even her farthest dominion.

General manufacturing has made some progress, but those lines which require great factories can thrive in remote regions of small population.

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TABLES

Table 1.—Area and Population of Principal Countries

Country	Area, square miles	Census		Estimated		Density per sq. mi. (census)	Largest city
		Year	Pop. (thousands)	Year	Pop. (thousands)		
North America							
United States (continental)	3,026,789	1920	105,711	1927	118,628	35.5	New York
Alaska	586,400	1920	55	....	....	.1	Juneau
Hawaii	6,449	1920	256	1928	330	39.7	Honolulu
Canada	3,654,200[1]	1921	8,788	1926	9,389	2.6	Montreal
Newfoundland	162,734	1921	263	....	....	1.6	St. Johns
Mexico	760,290	1921	14,235	1926	15,500	18.7	Mexico
Costa Rica	23,000	1927	472	....	....	20	San Jose
Guatemala	42,364	1921	2,005	1925	2,520	47.3	Guatemala
Honduras	46,000	1916	606	1923	773	13.1	Tegucigalpa
Nicaragua	49,500	1920	638	1926	650	12.9	Leon
Panama	32,388	1920	446	1925	500	13.8	Panama
Salvador	13,176	1886	651	1925	1,634	24[2]	San Salvador
British West Indies	12,414	1921	1,729	1925	1,826	13.9	Kingston
Cuba	44,164	1919	2,889	1926	3,562	65.4	Havana
Dominican Republic	19,300	1920	895	1926	1,000	46	Santo Domingo
Haiti	10,700	....	....	1926	2,300	215[2]	Port au Prince
Porto Rico	3,435	1920	1,300	1927	1,440	378.4	San Juan
South America							
Colombia	495,500	1918	5,855	1925	6,923	11.8	Bogota
Venezuela	393,976	1926	3,027	....	....	7.7	Caracas
Argentina	1,153,119	1914	7,885	1925	10,087	9[2]	Buenos Aires
Brazil	3,286,170	1920	30,636	1926	36,000	9.3	Rio de Janeiro
Paraguay	175,000	1899	556	1927	1,000	7[2]	Asuncion
Uruguay	72,172	1908	1,043	1925	1,678	22.9	Montevideo
Bolivia	787,000	1900	1,816	1926	2,599	3.3[2]	La Paz
Chile	289,890	1920	3,754	1926	3,947	12.9	Santiago
Ecuador	120,000	....	....	1926	2,000	17	Guayaquil
Peru	521,513	1876	2,699	1925	5,500	10.5	Lima
Europe							
Sweden	158,525[1]	1925	6,054	1926	6,074	38.2	Stockholm
Norway	125,017	1920	2,650	1926	2,770	22.2[2]	Oslo
Denmark	16,574	1925	3,435	....	....	207.2	Copenhagen
United Kingdom	94,278	1921	44,170	1926	45,190	468.5	London
Irish Free State	26,592	1926	2,973	....	....	111.8	Dublin
Belgium	11,754	1926	7,875	....	....	669.9	Brussels
France	212,736	1926	40,744	....	....	191.5	Paris
Netherlands	13,213	1920	6,865	1926	7,526	519.6	Amsterdam
Austria	32,368	1923	6,535	1925	6,700	201.9	Vienna
Czechoslovakia	54,206	1921	13,613	1925	14,165	251.1	Prague
Hungary	35,875	1920	7,980	1926	8,454	222.4	Budapest
Germany	180,972	1925	62,569	....	....	345.7	Berlin

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[1] *Land area.*

[2] Based on estimated population.

TABLE 1.—*Continued*

Country	Area square miles	Census		Estimated		Density per sq. mi. (census)	Largest city
		Year	Pop. (thousands)	Year	Pop. (thousands)		
Europe.—*Continued*							
Switzerland	15,944	1920	3,880	1925	3,936	243.4	Zurich
Estonia	18,359	1922	1,107	1926	1,117	60.3	Reval
Finland	132,676[1]	1920	3,365	1925	3,511	25.4	Helsingfors
Latvia	25,402	1925	1,845	....	....	72.6	Riga
Lithuania	20,557	1925	2,029	....	....	98.7	Kovno
Poland	149,957	1921	27,177	1926	29,319	181.2	Warsaw
Russia (including Asiatic)	8,189,374	1926	144,815	....	....	17.7	Moscow
Italy	119,748	1921	38,711	1925	40,549	323.3	Milan
Portugal (and islands)	35,796	1920	6,033	1925	6,185	168.5	Lisbon
Spain	195,061	1920	21,959	1925	22,128	112.6	Madrid
Bulgaria	39,825	1926	5,483	....	....	137.7	Sofia
Greece	49,165	1920	5,536	1925	6,800	112.6	Athens
Rumania	113,887	1912	7,248[2]	1926	17,154	150.6[1]	Bucharest
Yugoslavia	96,134	1921	12,017	....	....	125	Belgrade
Asia							
Turkey (including European)	283,000	....	....	1927	13,357	47	Constantinople
Arabia	1,100,000	....	....	1927	6,000	5	Mecca
Persia	628,000	....	....	1927	10,000	.....	Teheran
India	1,805,332	1921	318,942	....	....	176.9	Calcutta
Dutch East Indies	733,645	1920	49,351	1925	53,230	67.3	Batavia
Philippine Islands	114,400	1918	10,314	1928	11,600	102.7	Manila
Siam	200,148	1920	9,207	1925	9,724	460	Bangkok
China (Dominion)	4,300,000	....	....	1927	442,000[3]	100[1]	Shanghai
China (proper)	1,900,000	....	....	1927	435,000[3]	230[1]	
Japan (Empire)	260,251	1925	83,454	....	....	320.7	
Japan (proper)	147,201	1925	59,737	....	....	405.8	Osaka
Oceania							
Australia	2,974,581	1921	5,436[3]	1926	6,044[3]	1.8	Sydney
New Zealand	103,285	1926	1,407	....	....	13.6	Wellington
Africa							
Algeria	222,206	1926	6,146	....	....	.....	Algiers
Tunisia	48,332	1926	2,262	....	....	46.8	Tunis
Morocco	160,232	1921	5,480	1926	5,557	.....	Rabat
Egypt	385,000[4]	1927	14,169	....	....	(4)	Cairo
Union of South Africa	472,347	1921	6,929	1926	7,542	14.7	Johannesburg

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[1] Based on estimated population.

[2] Old boundaries.

[3] These official estimates are too high. Other estimates are 340,000,000 for the dominion and 310,000,000 for China proper.

[4] Mostly desert. Occupied lands are estimated at about 12,300 square miles, and on this basis the density would be 1,152 persons per square mile.

Table 2.—Foreign Commerce of Twenty Countries, 1926

Country	Imports	Exports	Total
United States	$4,430,900,000	$4,808,700,000	$9,239,600,000
United Kingdom	5,912,200,000	3,777,100,000	9,689,300,000
Germany	2,368,400,000	2,328,400,000	4,696,800,000
France	1,928,300,000	1,928,900,000	3,857,200,000
Netherlands	979,200,000	701,400,000	1,680,600,000
Belgium	748,100,000	633,600,000	1,381,700,000
Italy	1,006,200,000	726,200,000	1,732,400,000
Russia	346,700,000	303,200,000	649,900,000
Sweden	398,700,000	379,900,000	778,600,000
Spain	414,500,000	309,700,000	724,200,000
Canada	1,008,300,000	1,283,900,000	2,292,200,000
Mexico	183,400,000	333,700,000	517,100,000
Cuba	260,800,000	301,700,000	562,500,000
Argentina	757,900,000	730,000,000	1,487,900,000
Brazil	390,700,000	460,700,000	851,400,000
Chile	148,000,000	226,800,000	374,800,000
Japan	1,120,200,000	963,400,000	2,083,600,000
China	868,800,000	671,500,000	1,540,300,000
British India	848,800,000	1,196,000,000	2,044,800,000
Australia	770,300,000	640,100,000	1,410,400,000

TABLE 3.—STATISTICS OF STATES AND TERRITORIES

States, etc.	Capitals	Largest cities	Area in sq. miles	Population, 1920	Population est.,[1] 1928
Alabama	Montgomery	Birmingham	51,998	2,348,174	2,573,000
Arizona	Phoenix	Phoenix	113,956	334,162	474,000
Arkansas	Little Rock	Little Rock	53,335	1,752,204	1,944,000
California	Sacramento	Los Angeles	158,297	3,426,861	4,556,000
Colorado	Denver	Denver	103,948	939,629	1,090,000
Connecticut	Hartford	New Haven	4,965	1,380,631	1,667,000
Delaware	Dover	Wilmington	2,370	223,003	244,000
Florida	Tallahassee	Jacksonville	58,666	968,470	1,411,000
Georgia	Atlanta	Atlanta	59,265	2,895,832	3,203,000
Idaho	Boise	Boise	83,888	431,866	546,000
Illinois	Springfield	Chicago	56,665	6,485,280	7,396,000
Indiana	Indianapolis	Indianapolis	36,354	2,930,390	3,176,000
Iowa	Des Moines	Des Moines	56,147	2,404,021	2,428,000
Kansas	Topeka	Kansas City	82,158	1,769,257	1,835,000
Kentucky	Frankfort	Louisville	40,598	2,416,630	2,553,000
Louisiana	Baton Rouge	New Orleans	48,506	1,798,509	1,950,000
Maine	Augusta	Portland	33,040	768,014	795,000
Maryland	Annapolis	Baltimore	12,327	1,449,661	1,616,000
Massachusetts	Boston	Boston	8,266	3,852,356	4,290,000
Michigan	Lansing	Detroit	57,980	3,668,412	4,591,000
Minnesota	St. Paul	Minneapolis	84,682	2,387,125	2,722,000
Mississippi	Jackson	Meridian	64,865	1,790,618	1,790,618[2]
Missouri	Jefferson City	St. Louis	69,420	3,404,055	3,523,000
Montana	Helena	Butte	146,997	548,889	548,889[2]
Nebraska	Lincoln	Omaha	77,520	1,296,372	1,408,000
Nevada	Carson City	Reno	110,690	77,407	77,407[2]
New Hampshire	Concord	Manchester	9,341	443,083	456,000
New Jersey	Trenton	Newark	8,224	3,155,900	3,821,000
New Mexico	Santa Fe	Albuquerque	122,634	360,350	396,000
New York	Albany	New York	49,204	10,385,227	11,550,000
North Carolina	Raleigh	Winston-Salem	52,426	2,559,123	2,938,000
North Dakota	Bismarck	Fargo	70,837	646,872	641,192[3]
Ohio	Columbus	Cleveland	41,040	5,759,394	6,826,000
Oklahoma	Oklahoma City	Oklahoma City	70,057	2,028,283	2,426,000
Oregon	Salem	Portland	96,699	783,389	902,000
Pennsylvania	Harrisburg	Philadelphia	45,126	8,720,017	9,854,000
Rhode Island	Providence	Providence	1,248	604,397	716,000
South Carolina	Columbia	Charleston	30,989	1,683,724	1,864,000
South Dakota	Pierre	Sioux Falls	77,615	636,547	704,000
Tennessee	Nashville	Memphis	42,022	2,337,885	2,502,000
Texas	Austin	an Antonio	265,896	4,663,228	5,487,000
Utah	Salt Lake City	Salt Lake City	84,990	449,396	331,000
Vermont	Montpelier	Burlington	9,564	352,428	352,428[2]
Virginia	Richmond	Richmond	42,627	2,309,187	2,575,000
Washington	Olympia	Seattle	69,127	1,356,621	1,587,000
West Virginia	Charleston	Wheeling	24,170	1,463,701	1,724,000
Wisconsin	Madison	Milwaukee	56,066	2,632,067	2,953,000
Wyoming	Cheyenne	Cheyenne	97,914	194,402	247,000
Territories, etc.					
Alaska	Juneau	Fairbanks	590,884	55,036	60,000
Dist. of Columbia	Washington	Washington	70	437,571	540,000
Hawaii	Honolulu	Honolulu	6,449	255,912	330,000
Porto Rico	San Juan	San Juan	3,435	1,299,809	1,400,000
			3,689,287	107,321,377	120,958,000
Philippine Islands	Manila	Manila	115,026	10,350,640	11,600,000
Tutuila, etc	Pago Pago	Leone	77	8,056	9,000
Guam	Agaña	....	210	13,275	17,000
Canal Zone	....	....	527	22,858	28,000
Virgin Islands of U. S.	St. Thomas	St. Thomas	132	26,051	26,000
In U. S. Service abroad	....	....	....	117,238	120,000
United States, etc.	Washington	New York	3,805,259	117,859,495	132,758,000

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[1] Official estimate, July 1, 1928.
[2] Population January 1, 1920.
[3] Population, State Census, 1925.

TABLE 4.—STATE STATISTICS

State	Value of farm property, 1925	Estimated value of all crops, 1926	Value of manufactures, 1925	Value of mineral pr'd's, 1926
Alabama	$ 500,740,000	$ 174,800,000	$ 552,800,000	$ 83,700,000
Arizona	194,048,000	25,900,000	138,800,000	115,000,000
Arkansas	628,846,000	191,300,000	195,200,000	84,500,000
California	3,424,785,000	425,700,000	2,443,000,000	523,400,000
Colorado	712,284,000	108,800,000	278,800,000	65,600,000
Connecticut	230,828,000	38,500,000	1,274,900,000	7,700,000
Delaware	72,798,000	14,500,000	125,400,000	400,000
Florida	513,884,000	71,000,000	267,000,000	19,800,000
Georgia	686,673,000	211,600,000	648,900,000	17,500,000
Idaho	451,884,000	93,900,000	97,000,000	31,800,000
Illinois	4,627,964,000	390,000,000	5,321,800,000	237,200,000
Indiana	1,931,742,000	225,000,000	2,125,000,000	118,700,000
Iowa	5,602,077,000	428,600,000	757,800,000	36,000,000
Kansas	2,504,339,000	329,900,000	706,300,000	165,100,000
Kentucky	963,568,000	180,400,000	453,900,000	146,800,000
Louisiana	385,910,000	134,600,000	710,000,000	62,200,000
Maine	245,969,000	81,200,000	371,800,000	5,800,000
Maryland	397,092,000	71,100,000	926,300,000	24,100,000
Massachusetts	293,405,000	44,800,000	3,426,600,000	16,800,000
Michigan	1,523,976,000	250,600,000	4,373,200,000	130,900,000
Minnesota	2,761,684,000	327,000,000	1,101,900,000	118,400,000
Mississippi	550,570,000	192,800,000	200,500,000	1,800,000
Missouri	2,286,639,000	276,400,000	1,607,200,000	90,000,000
Montana	574,897,000	114,900,000	205,500,000	79,800,000
Nebraska	2,874,477,000	257,300,000	443,300,000	3,300,000
Nevada	98,086,000	9,000,000	21,600,000	27,600,000
New Hampshire	107,084,000	19,600,000	327,400,000	4,100,000
New Jersey	311,084,000	53,100,000	3,539,200,000	77,100,000
New Mexico	236,300,000	33,800,000	19,500,000	28,500,000
New York	1,706,929,000	285,500,000	8,968,500,000	112,000,000
North Carolina	1,050,015,000	327,700,000	1,050,400,000	11,000,000
North Dakota	1,191,036,000	190,700,000	44,600,000	2,800,000
Ohio	2,236,901,000	299,900,000	5,347,500,000	253,900,000
Oklahoma	1,210,134,000	308,500,000	403,300,000	569,500,000
Oregon	714,410,000	89,800,000	352,900,000	7,000,000
Pennsylvania	1,460,702,000	259,800,000	6,901,800,000	1,055,800,000
Rhode Island	33,446,000	4,700,000	621,900,000	1,300,000
South Carolina	523,084,000	142,800,000	373,400,000	3,700,000
South Dakota	1,658,921,000	118,500,000	63,400,000	7,600,000
Tennessee	883,646,000	175,600,000	601,500,000	39,300,000
Texas	3,471,867,000	631,600,000	1,238,000,000	420,600,000
Utah	250,317,000	36,800,000	177,200,000	99,000,000
Vermont	180,911,000	42,500,000	138,300,000	15,000,000
Virginia	999,465,000	172,100,000	589,500,000	46,100,000
Washington	823,437,000	147,200,000	659,300,000	21,300,000
West Virginia	411,159,000	74,700,000	470,800,000	395,900,000
Wisconsin	2,272,402,000	300,800,000	1,859,200,000	20,700,000
Wyoming	240,396,000	30,400,000	108,000,000	79,000,000
Total	$57,012,911,000	$8,415,700,000	$62,630,100,000	$5,548,100,000

Table 5.—Population of Cities of the United States

	U. S. estimate 1926	1920	1910	1900	1880	1860
New York	5,924,000	5,620,048	4,766,883	3,437,202	1,911,698	1,174,779
Chicago	3,048,000	2,701,705	2,185,283	1,698,575	503,185	109,260
Philadelphia	2,008,000	1,823,779	1,549,008	1,293,697	847,170	565,529
Detroit	1,290,000	993,678	465,766	285,704	116,340	45,619
Cleveland	960,000	793,841	560,663	381,768	160,146	43,417
St. Louis	830,000	772,897	687,029	575,238	350,518	160,773
Boston	787,000	748,060	670,585	560,892	362,839	177,840
Baltimore	808,000	733,826	558,485	508,957	332,313	212,418
Pittsburgh	637,000	588,343	533,905	451,512	235,071	77,923
Los Angeles	no. est.	576,673	319,198	102,479	11,183	4,385
Buffalo	544,000	506,775	523,715	352,387	155,134	81,129
San Francisco	567,000	506,676	416,912	342,782	233,959	56,802
Milwaukee	517,000	457,147	373,857	285,315	115,587	45,246
Washington, D. C.	528,000	437,571	331,069	278,718	177,624	75,080
Newark	459,000	414,524	347,469	246,070	136,508	7,941
Cincinnati	411,000	401,247	363,591	325,902	255,139	161,044
New Orleans	419,000	387,219	339,075	287,104	216,090	168,675
Minneapolis	434,000	380,582	301,408	202,718	46,887	2,564
Kansas City, Mo	375,000	324,410	248,381	163,752	55,785	4,418
Seattle	no. est.	315,312	237,194	80,671	3,533	
Indianapolis	368,000	314,194	233,650	169,164	75,056	18,611
Jersey City	318,000	298,103	267,779	206,433	120,722	29,226
Rochester, N. Y	321,000	295,750	218,149	162,608	89,366	48,204
Portland, Ore	no. est.	258,288	207,214	90,426	17,577	2,874
Denver	285,000	256,491	213,381	133,859	35,629	
Toledo	295,000	243,164	168,497	131,822	50,137	13,768
Providence, R. I	275,000	237,595	224,326	175,597	104,857	50,666
Columbus, Ohio	285,000	237,031	181,511	125,560	51,647	18,554
Louisville	311,000	234,891	223,928	204,731	123,758	68,033
St. Paul	248,000	234,698	214,744	163,065	41,473	10,401
Oakland, Calif	261,000	216,261	150,174	66,960	34,555	1,543
Akron, Ohio	no. est.	208,435	69,067	42,728	16,512	3,477
Atlanta, Ga	no. est.	200,616	154,839	89,872	37,409	9,554
Omaha, Nebr	216,000	191,601	124,096	102,555	30,518	1,883
Worcester, Mass	193,000	179,754	145,986	118,421	58,291	24,960
Birmingham, Ala	211,000	178,806	132,685	38,415	3,086	
Syracuse, N. Y	185,000	171,717	137,249	108,374	51,792	28,119
Richmond, Va	189,000	171,667	127,628	85,050	63,600	37,910
New Haven, Conn	182,000	162,537	133,605	108,027		
Memphis, Tenn	177,000	162,351	131,105	102,320	33,592	22,623
San Antonio, Tex	205,000	161,379	96,614	53,321	20,550	8,235
Dallas, Tex	203,000	158,976	92,104	42,638	10,358	
Dayton, Ohio	177,000	152,559	116,577	85,333	38,678	20,081
Bridgeport, Conn	no. est.	143,355	102,054	70,996	27,643	
Houston, Tex	no. est.	138,276	78,800	44,633	16,513	4,845
Hartford, Conn	164,000	138,036	98,915	79,850	42,015	
Scranton, Pa	143,000	137,783	129,867	102,026	45,850	9,223
Grand Rapids, Mich	156,000	137,634	112,571	87,565	32,016	8,085
Paterson, N. J	143,000	135,875	125,600	105,171	51,031	19,586
Youngstown, Ohio	165,000	132,358	79,066	44,885	15,435	2,759
Springfield, Mass	145,000	129,614	88,926	62,059	33,340	15,199
Des Moines, Iowa	146,000	126,468	86,368	62,139	22,408	3,965
New Bedford, Mass	no. est.	121,217	96,652	62,442	26,845	22,300
Fall River, Mass	131,000	120,485	119,295	104,863	48,961	14,026
Trenton, N. J	134,000	119,289	96,815	73,307	29,910	17,228
Nashville, Tenn	137,000	118,342	110,364	80,865	43,350	16,988
Salt Lake City, Utah	133,000	118,110	92,777	53,531	20,768	8,236
Camden, N. J	137,000	116,309	94,538	75,935	41,659	14,358
Norfolk, Va	174,000	115,777	67,452	46,624	21,966	14,620
Albany, N. Y	119,000	113,344	100,253	94,152	90,758	62,367
Lowell, Mass	no. est.	112,759	106,294	94,969	59,475	36,827
Wilmington, Del	124,000	110,108	87,411	76,508	42,478	21,258
Cambridge, Mass	122,000	109,694	104,839	91,886	52,669	26,060
Reading, Pa	114,000	107,784	96,071	78,961	43,278	23,162
Fort Worth, Tex	159,000	106,482	73,312	26,688	6,663	
Spokane, Wash	109,000	104,437	104,402	36,848		
Kansas City, Kan	117,000	101,177	82,331	51,418	3,200	
Yonkers, N. Y	116,000	100,176	79,803	47,931	18,892	

No estimates made for cities that showed a decrease at the census of 1920, or where there were exceptional conditions of growth.

TABLE 6.—LARGEST CITIES OF THE WORLD

City	Year	Population	City	Year	Population
London (Greater)	'26	7,790,000	Budapest	'21	1,185,000
New York	'27	5,971,000	Bombay	'21	1,176,000
Berlin	'25	4,014,000	Hamburg	'25	1,079,000
Chicago	'27	3,103,000	Cairo	'27	1,060,000
Paris (without suburbs)	'26	2,871,000	Glasgow	'26	1,049,000
Osaka	'25	2,115,000	Sydney	'25	1,039,000
Philadelphia	'27	2,036,000	Peiping	'26	1,297,000
Moscow	'26	2,018,000	Warsaw	'26	1,015,000
Buenos Aires	'27	2,000,000	Cleveland	'27	985,000
Tokyo	'25	1,996,000	Birmingham	'26	934,000
Vienna	'23	1,866,000	Melbourne	'25	912,000
Leningrad	'26	1,611,000	Canton	'26	900,000
Shanghai	'26	1,550,000	Constantinople	'24	880,000
Rio de Janeiro	'26	1,400,000	Milan	'25	878,000
Detroit	'27	1,335,000	Hongkong	'26	874,000
Calcutta	'21	1,328,000	Liverpool	'26	862,000
Hankow area	'26	1,321,000	Naples	'25	858,000
Los Angeles	'27	1,300,000	St. Louis	'27	839,000

TABLE 7.—CITIES OF THE WORLD HAVING OVER 500,000 POPULATION

City	Year	Population	City	Year	Population
Amsterdam	'22	696,000	Lyon	'26	570,000
Baltimore	'27	819,000[1]	Madras	'21	527,000
Barcelona	'26	746,000	Madrid	'26	729,000
Batavia	'25	729,000	Manchester	'26	752,000
Berlin	'25	4,014,000	Marseille	'26	652,000
Birmingham	'26	934,000	Melbourne	'25	912,000
Bombay	'21	1,176,000	Mexico city	'21	615,000
Boston	'27	793,000[1]	Milan	'25	878,000
Breslau	'25	555,000	Milwaukee	'27	536,000[1]
Brussels	'26	759,000	Montreal	'26	685,000
Budapest	'21	1,185,000	Moscow	'26	2,018,000[2]
Buenos Aires	'27	2,000,000[3]	Munich	'25	681,000
Buffalo	'27	550,000	Nagoya	'25	769,000
Cairo	'27	1,060,000	Naples	'25	858,000
Calcutta	'21	1,328,000	New York	'27	5,971,000[1]
Canton	'26	900,000[2]	Osaka	'25	2,115,000
Chicago	'27	3,103,000[1]	Paris (without suburbs)	'26	2,871,000
Cleveland	'27	985,000[1]	Peiping	'26	1,297,000[2]
Cologne	'25	698,000	Philadelphia	'27	2,036,000[1]
Constantinople	'24	880,000	Pittsburgh	'27	666,000[1]
Copenhagen	'21	701,000	Prague	'26	725,000
Detroit	'27	1,335,000[1]	Rio de Janeiro	'26	1,400,000
Dresden	'25	619,000	Rome	'25	768,000
Foochow	'26	624,000[2]	Rotterdam	'25	552,000
Genoa	'25	588,000	St. Louis	'27	839,000[1]
Glasgow	'26	1,049,000	San Francisco	'27	576,000[1]
Hamburg	'25	1,079,000	Santiago (Chile)	'26	574,000
Hangchow	'26	594,000[2]	Sao Paulo	'20	700,000
Hankow area	'26	1,321,000[2]	Shanghai	'26	1,550,000[2]
Havana	'25	563,000	Sheffield	'26	523,000
Hongkong	'26	874,000[2]	Sydney	'25	1,039,000
Kobe	'25	644,000	Tientsin	'26	800,000[2]
Kyoto	'25	680,000	Tokyo	'25	1,996,000
Leipzig	'25	679,000	Toronto	'21	542,000
Leningrad	'26	1,611,000[2]	Turin	'25	516,000
Liverpool	'26	862,000	Vienna	'23	1,866,000
London (Greater)	'26	7,790,000	Warsaw	'26	1,015,000[3]
Los Angeles	'27	1,300,000[3]	Washington	'27	540,000[1]

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[1] U. S. Census Bureau estimates for July 1, 1927.

[2] Chinese and Russian figures not dependable. Chinese list of cities incomplete.

[3] Estimate by local officials.

TABLE 8.—IMPORTS AND EXPORTS OF THE UNITED STATES, BY GREAT TRADE REGIONS

(Data cover period beginning July 1, 1876, and ending Dec. 31, 1926. Hawaiian Islands are included in Oceania prior to 1901; the Philippine Islands are in Asia for all years)

(Values in millions of dollars)

Yearly average or year	Total	North America				South America		Europe		Asia		Oceania		Africa	
		Northern		Southern											
		Value	Per cent	Value	Per cent	Value	Per cent	Value	Per cent	Value	Per cent	Value	Per cent	Value	Per cent
Exports															
1876–1880.......	677	34	5.0	36	5.4	22	3.3	562	83.1	11	1.7	7	1.1	4	0.6
1881–1885.......	792	43	5.4	45	5.7	28	3.6	642	81.0	18	2.2	13	1.6	4	.5
1886–1890.......	738	39	5.2	43	5.8	32	4.3	586	79.3	20	2.8	15	2.0	3	.5
1891–1895.......	892	49	5.5	61	6.8	33	3.7	709	79.5	21	2.3	14	1.6	5	.6
1896–1900.......	1,157	80	6.9	65	5.6	36	3.1	887	76.7	45	3.9	26	2.3	17	1.5
1901–1905.......	1,454	125	8.6	98	6.7	46	3.2	1,061	72.3	77	5.3	30	2.0	28	1.9
1906–1910.......	1,779	181	10.2	155	8.7	82	4.6	1,213	68.2	97	5.5	32	1.8	18	1.0
1911–1915.......	2,371	337	14.2	182	7.7	122	5.2	1,517	64.0	133	5.6	52	2.2	27	1.1
1915–1920[1]......	6,521	780	12.0	503	7.7	361	5.5	4,124	63.2	562	8.6	109	1.7	82	1.3
1921–1925.......	4,397	627	14.3	445	10.1	297	6.8	2,318	52.7	499	11.3	141	3.2	70	1.6
1910–1914 (fiscal)	2,166	320	14.8	181	8.4	121	5.6	1,350	62.3	121	5.6	48	2.2	25	1.1
1913 (calendar)..	2,484	409	16.5	192	7.7	147	5.9	1,500	60.4	154	6.2	54	2.2	29	1.2
1921............	4,485	600	13.4	529	11.8	273	6.1	2,364	52.7	533	11.9	113	2.5	73	1.6
1922............	3,832	583	15.2	332	8.7	226	5.9	2,083	54.4	449	11.7	102	2.7	56	1.5
1923............	4,167	661	15.8	426	10.2	269	6.5	2,093	50.2	511	12.3	146	3.5	61	1.5
1924............	4,591	634	13.8	456	9.9	314	6.8	2,445	53.3	515	11.2	157	3.4	70	1.5
1925............	4,910	659	13.4	480	9.8	403	8.2	2,604	43.0	487	9.9	189	3.9	89	1.8
1926............	4,809	748	15.5	429	8.9	444	9.2	2,310	48.0	565	11.7	213	4.4	101	2.1
1927............	4,865	845	17.4	408	8.4	438	9.0	2,314	47.6	560	11.5	194	4.0	107	2.2
Imports															
1876–1880.......	493	28	5.6	87	17.6	68	13.8	248	50.3	56	11.3	5	.9	2	.5
1881–1885.......	667	42	6.3	96	14.4	76	11.4	368	55.1	70	10.5	11	1.7	4	.6
1886–1890.......	717	40	5.6	99	13.8	82	11.5	402	56.0	74	10.4	16	2.3	3	.5
1891–1895.......	785	36	4.6	128	16.3	117	14.9	398	50.6	85	10.8	16	2.1	5	.6
1896–1900.......	742	37	5.0	76	10.3	98	13.2	390	52.6	108	14.6	23	3.1	10	1.3
1901–1905.......	972	53	5.4	130	13.3	122	12.5	498	51.3	150	15.4	9	.9	11	1.1
1906–1910.......	1,345	80	5.9	180	13.4	157	11.7	690	51.3	205	15.2	17	1.2	17	1.2
1911–1915.......	1,712	131	7.7	249	14.5	220	12.8	798	46.6	271	15.8	19	1.1	24	1.4
1915–1920[1]......	2,358	425	12.7	588	17.5	591	17.6	682	20.3	910	27.1	70	2.1	91	2.7
1921–1925.......	3,450	397	11.5	514	14.9	421	12.2	1,049	30.4	943	27.3	54	1.6	71	2.1
1910–1914 (fiscal)	1,689	119	7.0	229	13.5	207	12.2	836	49.5	259	15.3	17	1.0	23	1.3
1913 (calendar)..	1,793	143	8.0	246	13.7	198	11.1	865	48.2	299	16.7	17	.9	24	1.3
1921............	2,509	338	13.5	417	16.6	296	11.8	765	30.5	618	24.6	35	1.4	40	1.6
1922............	3,113	367	11.8	456	14.6	359	11.5	991	31.8	827	26.6	49	1.6	65	2.1
1923............	3,792	418	11.0	583	15.4	467	12.3	1,157	30.5	1,020	26.9	59	1.6	87	2.3
1924............	3,610	402	11.1	593	16.4	466	12.9	1,096	30.4	931	25.8	49	1.4	73	2.0
1925............	4,227	459	10.9	522	12.3	519	12.3	1,238	29.3	1,319	21.2	78	1.8	92	2.2
1926............	4,431	486	11.0	526	11.9	568	12.8	1,286	29.0	1,401	31.6	68	1.5	96	2.2
1927............	4,184	485	11.6	501	12.0	518	12.4	1,276	30.5	1,257	30.0	55	1.3	93	2.2

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[1] Period July 1, 1915, to Dec. 31, 1920.

Table 9.—Foreign Trade of the United States

(Values in millions and tenths of millions of dollars)

Region and Country	Exports			Imports		
	1910–1914	1926	1927	1910–1914	1926	1927
North America						
1. Northern, total	319.9	747.7	844.7	118.5	485.5	484.5
Canada	315.0	738.6	835.9	117.2	475.9	475.1
2. Southern, total	181.2	428.8	407.8	228.6	526.1	500.9
Mexico	53.1	135.0	109.2	70.5	169.3	137.8
Central America, total	37.6	75.1	76.4	17.4	48.9	40.4
Costa Rica	3.4	6.3	7.3	3.8	7.1	6.0
Guatemala	2.8	11.1	10.6	2.8	14.5	10.2
Honduras	2.8	7.5	8.5	2.8	8.7	9.3
Nicaragua	2.4	6.3	6.9	1.4	6.0	4.2
Panama	22.5	31.9	34.1	3.8	5.5	5.4
Salvador	2.1	9.6	6.9	1.3	4.2	1.5
West Indies, total	90.5	218.8	222.2	140.8	307.9	322.7
Jamaica	5.0[1]	8.4	8.6	6.1[1]	9.1	9.7
Trinidad and Tobago	3.3[1]	4.9	5.9	5.5[1]	8.2	7.6
Cuba	63.0	160.5	155.4	122.1	250.6	256.6
Dominican Republic	4.4	14.6	18.9	3.6	8.1	11.1
French West Indies	1.6	2.0	2.7	.1	.2	.1
Haiti, Republic of	5.9	10.9	11.1	.8	1.4	1.2
South America						
3. North coast, total	13.1	92.3	86.3	22.5	115.2	118.8
Colombia	5.8	49.3	48.7	11.9	90.2	87.8
Venezuela	4.5	39.7	34.7	9.1	23.3	28.6
4. East coast, total	84.7	263.0	278.5	148.3	342.5	311.8
Argentina	47.2	143.6	163.3	32.9	88.1	97.0
Brazil	31.5	95.4	88.7	110.9	235.3	203.0
Paraguay	.1	.9	1.3	(2)	.5	.9
Uruguay	5.9	23.0	25.0	4.5	18.5	10.9
5. West coast, total	23.2	88.2	73.2	36.0	110.3	87.4
Bolivia	.9	5.2	4.9	(2)	.3	.2
Chile	13.9	49.0	37.9	22.9	81.4	61.9
Ecuador	2.4	4.7	5.5	3.4	6.8	5.2
Peru	6.0	29.4	24.9	9.8	21.8	20.1
Latin America (Groups 2, 3, 4, 5)	302.2	872.3	845.7	435.5	1,094.0	1,018.9
Europe						
6. Northwestern and Central, total	1,222.9	1,984.5	1,976.3	723.8	1,070.2	1,050.9
Austria	20.6[3]	2.9	4.4	18.1[3]	9.4	10.6
Belgium	53.1	99.3	116.2	40.4	77.8	72.2
Czechoslovakia	....	3.0	7.4	....	28.3	31.7
Denmark	15.4	50.6	58.7	2.6	5.5	4.1
France	138.8	264.0	228.7	130.1	152.0	167.8
Germany	304.1	364.2	481.6	176.5	198.5	200.6
Hungary	(3)	1.0	1.8	(3)	.9	.9
Irish Free State	....	17.0	10.9	....	1.5	1.6
Netherlands	104.6	135.8	148.3	34.9	101.9	87.2
Norway	7.8	24.9	23.4	8.1	25.1	22.2
Sweden	10.0	40.9	44.6	9.5	44.0	47.9
Switzerland	.8	8.3	10.1	24.7	42.0	45.9
United Kingdom	567.6	972.6	840.1	278.9	383.2	357.9

[1] Four-year average, 1911–1914.

[2] Less than $50,000.

[3] Figures given for Austria are for Austria-Hungary.

Table 9.—*Continued*

(Values in millions and tenths of millions of dollars)

Region and Country	Exports			Imports		
	1910–1914	1926	1927	1910–1914	1926	1927
Europe—*Continued*						
7. Northeastern, total	25.9	67.0	92.0	19.3	34.9	30.9
Estonia	....	.8	.9	....	1.2	.4
Finland	3.0[1]	12.9	16.5	.2[1]	9.1	8.7
Latvia	....	.7	1.0	....	6.0	4.5
Lithuania	....	.1	.2	....	.9	.5
Poland and Danzig	....	3.9	9.3	....	4.1	4.8
Soviet Russia in Europe	23.5	48.5	64.1	19.1	13.5	12.0
8. Southwestern, total	96.5	240.2	219.6	79.6	151.1	149.7
Italy	66.0	157.4	131.7	51.1	102.5	108.9
Portugal	3.6	11.6	10.7	6.6	5.6	4.6
Spain	26.2	68.2	73.8	21.6	41.4	34.4
9. Southeastern, total	5.1	18.4	25.9	13.8	29.6	44.8
Bulgaria	.2	.4	.5	.4	1.3	.9
Greece	.9	10.4	15.0	3.3	16.9	29.6
Rumania	1.4	3.1	4.9	.2	1.1	.6
Turkey in Europe	2.2	2.5	3.4	8.9	9.0	12.4
Yugoslavia and Albania	(2)	.8	1.0	1.0	1.2	1.0
Asia and Oceania						
10. Western Asia, total	2.6	6.1	7.5	13.6	26.2	26.9
Persia	.1	.8	1.6	1.4	8.4	7.5
Turkey in Asia	1.1	.4	.6	10.4	7.9	7.7
11. Southern and southeastern Asia, total	40.6	166.8	184.7	119.8	815.2	657.9
British India	10.9	50.0	63.3	56.4	150.9	131.0
British Malaya	2.9	13.6	13.6	24.6	383.8	277.8
Netherland East Indies	3.1	27.6	32.1	9.2	119.6	91.4
Philippine Islands	22.6	68.6	69.5	19.4	103.8	116.0
12. Eastern Asia, total	77.8	391.7	367.5	125.2	559.3	572.1
China	21.6	110.2	83.5	35.3	143.2	151.7
Hongkong	9.1	12.8	18.9	3.1	11.3	14.8
Japan	45.3	260.8	257.6	85.0	400.7	402.1
13. Oceania, total	47.7	212.7	193.7	17.3	68.4	54.5
Australia	38.7	168.7	159.1	12.3	45.7	38.6
New Zealand	7.8	41.6	32.5	3.8	18.8	12.7
Far East (Groups 11, 12, 13)	166.2	771.1	745.9	262.2	1,442.8	1,284.5
Africa						
14. Mediterranean, total	4.9	23.9	25.3	18.1	39.4	39.3
Algeria and Tunisia	2.4[3]	6.7	7.1	.7[3]	3.2	4.7
Egypt	1.7	10.2	11.2	16.9	35.2	33.3
Morocco	.1	2.3	3.2	.2	.5	.7
15. Other Africa	19.7	77.4	82.0	4.5	57.0	53.9
Belgian Congo	(2)	1.2	.7	(2)	1.7	15.6
British Africa—						
West	3.2	9.9	13.8	.7	19.8	23.9
South	12.9	51.1	52.5	2.5	19.8	8.7
East	.7	4.0	4.8	.9	2.3	1.6

[1] Four-year average, 1911–1914.

[2] Less than $50,000.

[3] Algeria and Tunisia includes Other French Africa

TABLE 10.—EXPORTS OF LEADING COMMODITIES FROM THE UNITED STATES

(Values in millions and tenths of millions of dollars)

Commodity		Quantity		Value	
		1910–1914	1927	1910–1914	1927
Cotton, unmanufactured	million pounds	4,420	4,897	551.9	826.3
Petroleum and products		.....	.....	127.7	486.1
Refined oils	million barrels	37	116	110.5	429.9
Crude oil	do	4	16	6.4	25.9
Machinery[1]		.....	.....	158.2	435.5
Electrical and apparatus		.....	.....	20.9	84.6
Agricultural and implements		.....	.....	40.5	90.1
Industrial		.....	.....	78.6	201.5
Automobiles, parts and accessories[2]	thousands	19	384	24.1	388.3
Wheat, including flour	million bushels	105	229	106.2	324.8
Wheat grain	do	57	168	55.1	239.5
Packing-house products	million pounds	1,220	263	146.5	180.9
Meats	do	485	356	62.7	64.2
Fats and oils	do	735	907	83.8	116.8
Lard	do	474	681	52.1	92.0
Iron and steel mill products	thousand tons	2,180	2,182	91.3	160.6
Copper, including manufactures	million pounds	.....	1,077	121.2	150.2
Tobacco, unmanufactured	do	392	512	44.8	139.7
Cotton manufactures, including yarns, etc.		.....	.....	45.2	133.1
Cloths, duck, tire fabric	million square yards	399	562	27.1	76.5
Fruits and nuts		.....	.....	28.7	121.7
Coal and coke	million tons	18	20	55.7	109.7
Sawmill products		.....	.....	66.0	107.6
Boards and timber	million board feet	2,704	2,951	61.5	106.9
Iron and steel, advanced manufactures		.....	.....	45.0	73.3
Chemicals (coal tar, medicinal, industrial)		.....	.....	21.8	72.9
Rubber and manufactures		.....	.....	12.4	68.7
Automobile casings	thousands	.....	2,631	.....	33.8
Leather		.....	.....	39.1	54.0
Rye, including flour	million bushels	1	36	.6	39.9
Barley and malt	do	8	41	5.3	38.5
Wood manufactures (advanced)		.....	.....	25.7	38.1
Naval stores, gums and resins		.....	.....	23.4	34.3
Furs and manufactures		.....	.....	14.7	30.9
Oil cake and meal	million pounds	1,668	1,570	23.6	30.2
Paper and manufactures		.....	.....	10.7	27.0
Books and printed matter		.....	.....	9.2	24.2
Pigments, paints, and varnishes		.....	.....	6.8	20.9
Photographic goods		.....	.....	8.0	18.7
Leather manufactures		.....	.....	19.0	18.4
Fish		.....	.....	9.7	18.3
Dairy products		.....	.....	3.3	17.4

[1] Includes office appliances and printing machinery.

[2] The number is automobiles only; the value includes parts and accessories.

Table 11.—Imports of Leading Commodities into the United States

(Values in millions and tenths of millions of dollars)

Commodity	Quantity		Value	
	1910–1914	1927	1910–1914	1927
Silk, raw . . . million pounds	24	74	77.1	390.4
Rubber, crude . . . do.	106	955	86.3	339.9
Coffee . . . do.	899	1,433	101.5	264.3
Sugar, cane . . . do.	4,341	8,431	103.5	258.2
Paper and manufactures	.....	.....	10.7	149.4
Newsprint . . . million pounds	238	3,974	4.8	131.5
Furs and manufactures	.....	.....	22.6	135.6
Paper base stocks	.....	.....	27.5	113.6
Wood pulp . . . thousand tons	472	1,496	14.6	85.8
Petroleum and products	.....	.....	6.3	113.4
Crude oil . . . million barrels	7	58	5.9	78.6
Refined oils . . . do.		13		33.6
Hides and skins . . . million pounds	531	447	104.6	112.8
Tin: Bars, blocks, pigs . . . do.	106	159	41.5	100.9
Copper, including manufactures . . . do.	369	718	47.8	85.0
Wool and mohair . . . do.	208	267	39.3	82.9
Wool manufactures, including yarns, etc.	.....	.....	21.5	78.8
Vegetable oils, expressed . . . million pounds	267	773	26.5	78.7
Tobacco, unmanufactured . . . do.	56	103	31.7	74.6
Cotton manufactures, including yarn, etc.	.....	.....	67.4	66.2
Oilseeds . . . million pounds	491	1,832	15.1	64.3
Flaxseed . . . thousand bushels	7,258	21,821	12.3	37.8
Fertilizers . . . thousand tons	1,488	1,819	40.7	58.8
Chemicals (coal tar, industrial, medicinal)	.....	.....	41.6	57.8
Cocoa or cacao beans . . . million pounds	142	425	16.0	56.8
Diamonds . . . thousand carats	.....	717	34.7	54.4
Cotton, unmanufactured . . . million pounds	111	206	20.7	45.7
Silk manufactures	.....	.....	29.9	42.2
Tea . . . million pounds	95	89	16.7	28.2

TABLE 12.—FOREMOST UNITED STATES MANUFACTURING INDUSTRIES, 1925

Motor vehicles, bodies, and parts	$4,721,403,000
Iron and steel, blast furnaces, and rolling mills	3,713,468,000
Slaughtering and meat packing, wholesale	3,050,286,000
Clothing	2,380,943,000
Petroleum refining	2,376,656,000
Printing and publishing	2,269,638,000
Foundry and machine shop products	2,232,985,000
Lumber and timber products	2,131,923,000
Cotton goods	1,819,886,000
Electrical machinery, apparatus, and supplies	1,540,002,000
Railway car construction and repair	1,332,679,000
Flour, feed, and other grain-mill products	1,298,014,000
Bread and other bakery products	1,268,194,000
Smelting and refining, copper, lead, zinc, excluding gold, silver, platinum	1,149,202,000
Tobacco and its products	1,091,000,000
Butter, cheese, and condensed and evaporated milk	973,518,000
Paper and wood pulp	971,882,000
Woolen and worsted goods	957,790,000
Boots and shoes (not rubber)	925,383,000
Rubber tires and inner tubes	925,001,000

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